STD RESEARCH FORUM AND NATIONAL GOALS STRATEGY MEETING

February 25-26, 1999
Ottawa

Division of STD Prevention and Control
Bureau of HIV/AIDS, STD & TB
Laboratory Centre for Disease Control, Health Canada

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Foreword

The STD Research Forum and National Goals Strategy Meeting, hosted by the Division of STD Prevention and Control, was held in Ottawa from February 25-26, 1999. The aim was to bring together the latest developments in social/sexual network analysis, surveillance, laboratory science, viral STDs, STD guidelines and training, and issues associated with higher risk populations in order to assess progress toward recently established national STD goals, and if necessary, to consider new strategies that may make those goals more attainable.

We hope that you will find this a useful document of the current status and future directions of STD prevention and control activities in Canada. On behalf of the Division and the Bureau, we want to thank you for your valuable contributions in translating science and goals into action in our collective fight to reduce STDs in Canada.

Sincerely,

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Executive Summary

The STD Research Forum and National Goals Strategy Meeting, hosted by the Division of STD Prevention and Control, Laboratory Centre for Disease Control, was held in Ottawa from February 25-26, 1999. The aim was to bring together the latest developments in social/sexual network analysis, surveillance, laboratory science, viral STDs, STD guidelines and training, and investigation of higher risk populations in order to assess progress towards recently established national STD goals and, if necessary, to consider new strategies that may make those goals more attainable.

The conference opened with introductory remarks from Dr. Paul Gully, Deputy Director-General, Laboratory Centre for Disease Control (LCDC), on the need for accountability and for STD program development to be placed firmly in the wider context of disease control. Dr. Tom Wong, Chief of the Division of STD Prevention and Control, Bureau of HIV/AIDS, STD and TB, LCDC, emphasized the importance of STD control in light of recent evidence that a history of one or more of these diseases results in a greater likelihood of infection with HIV, which, unlike bacterial STD, is not easily curable. The national syphilis elimination campaign recently launched in the U.S. has a goal that could be viewed as more easily achievable in Canada, where syphilis incidence rates are 10 times lower. From the laboratory perspective on STD goals, Dr. Rosanna Peeling, Bureau of Microbiology, Health Canada, raised the issues of the newer technologies and their effects, and the expertise/capacity necessary to track organisms that are becoming rare.

In the first section of the conference the social network model of disease transmission was presented — a street-based, ethnographic approach that involves interviewing infected individuals together with all their contacts (sexual, social, drug-related) and constructing a matrix of the interactions between them. A combination of this method and genotyping was used to good effect in the investigation of transmission patterns in chlamydia and gonorrhea.

The findings from national surveillance were that chlamydia was again the most common STD, accounting for 85% of all those reported in 1996. Overall, national STD rates have been falling. In British Columbia there has been an outbreak of infectious syphilis, beginning in mid-1997 and continuing to the present. Several provinces noted increases in 1998 of chlamydia and gonorrhea, which, in some provinces, may have been due to the introduction of the more sensitive nucleic acid amplification (NAA) techniques. General discussion brought out the concern that these higher incidence rates may mark a new stage of transmission, in which the rate flattens off or increases slightly as diseases become concentrated in core groups that are hard to reach with traditional public health methods.

The National Laboratory for STDs has found that the number of penicillinase-producing *Neisseria gonorrhoeae* (PPNG) has decreased dramatically in recent years. Double resistance to tetracycline and penicillin has been a new finding in the past decade. With the trend towards use of non-cultural methods of detecting chlamydia and gonorrhea, new techniques must be considered for identifying serotypes of *N. gonorrhoeae* and monitoring resistance.

With regard to viral STDs, in an Ontario study, the prevalence of human papillomavirus (HPV) among women was found to be 12.4%, and the main risk factors were early age at first intercourse and > 5 lifetime sexual partners. Data on genital herpes in Canada are lacking, as are guidelines on testing and counselling. A new section of Viral STDs to be established at the National Laboratory will be collaborating with the provinces and territories.

The new *STD Guidelines* together with a 20-page *Highlights* have been completed and will be ready for distribution shortly. A study of compliance with guidelines has shown that the proportion of correctly treated cases of pelvic inflammatory disease (PID) was low, and that screening for chlamydia needs to be further encouraged. This latter echoes a concern that was evident throughout the conference: that the age group at highest risk of chlamydia (i.e., 15-24 years) is not regularly screened. Compliance with guidelines may be facilitated by an educational intervention together with feedback provided in later months. Self-learning modules to enhance the skills of professionals will be developed later this year.

The results were presented of studies on high-risk populations, e.g., street youth, injection drug users, sexually active adolescent females and immigrant groups. A number of risk factors emerged, including young age, early age at first intercourse, involuntary first intercourse and injection drug use. Immigrants to Canada are at present screened for syphilis, and after treatment in their home country are referred for surveillance on arrival in Canada, a practice whose usefulness has been questioned. Decision tree analysis will be carried out for a number of diseases that may be imported through the immigration route. With regard to syphilis, if treatment is considered to be completely reliable, the costs of screening immigrants to exclude them from the country in the case of disease are the same as screening and allowing them entry.

Introduction

The STD Research Forum and National Goals Strategy Meeting, hosted by the Division of STD Prevention and Control, Laboratory Centre for Disease Control, was held in Ottawa from February 25-26, 1999. The aim was to bring together the latest developments in social/sexual network analysis, surveillance, laboratory science, viral STDs, STD guidelines and training, and investigation of higher risk populations in order to assess progress towards recently established national STD goals and, if necessary, to consider new strategies that may make those goals more attainable.

Dr. Paul Gully

Dr. Gully referred to the recent re-appraisal that the Laboratory Centre for Disease Control (LCDC), Health Canada, has undertaken of its current activities and plans for the next decade. There is a new focus on what needs to be accomplished to meet future needs and a greater emphasis on accountability. International trends will be important considerations in this new initiative, providing relevant information on such issues as transmission of disease, antimicrobial resistance and the effects of social change on patterns of disease. LCDC will be trying to fill some of the gaps in its surveillance activities by looking at women's health, Aboriginal issues, and risk factor surveillance in both chronic and communicable diseases.

Plans for the prevention and control of sexually transmitted diseases (STDs) must be developed in the context of infectious and chronic diseases as a whole, so that a clear account of overall needs is available in any transactions with outside groups, such as the Canadian Institute for Health Information. As well, STD programming should take into consideration the contributions that can be made in such areas as laboratory science, epidemiologic analysis and behavioural approaches to disease prevention. In line with this, the conference program involves a number of different perspectives.

Dr. Gully hoped that in the coming two days, conference participants would bear in mind the larger context of disease prevention and the necessity to measure performance.

Dr. Tom Wong

Dr. Wong outlined the process that began three years ago of developing STD goals that were specific, measurable, achievable, resource-sensitive and timed. Groups of experts from medical, academic, public health and research backgrounds were invited to prepare papers on specific STDs and related risk behaviours. At a meeting of the authors of these papers and members of LCDC's Division of STD Prevention and Control, goal statements were developed and ways of promoting healthy sexual behaviour were identified. Finally, a national consensus meeting was held to obtain feedback from stakeholders across the country.

Rates of reported STDs have been declining in Canada annually, but there is still room for improvement. In the United States, the Centers for Disease Control and Prevention recently launched a national syphilis elimination campaign, a goal that could be viewed as much more achievable in Canada, where syphilis rates are 10 times lower than the U.S. rates. Recent outbreaks of STD in some provinces illustrate the need for enhanced vigilance. Dr. Wong emphasized the synergy between STDs and HIV. Many bacterial STDs and their associated risky sexual behaviours increase the transmission of HIV. Although HIV is not curable, bacterial STDs are easily treatable and sexual behaviours are modifiable.

LCDC, the provinces and territories, and national organizations have initiated several STD-related projects: a national study of street youth, their sexual behaviour, knowledge and attitudes; revision of the *STD guidelines*; development of nucleic acid amplification techniques in STD screening; and one of the first provincial studies of the prevalence of human papillomavirus. These initiatives will be discussed during the two days of the conference. There is a need to learn from each other's successes and failures, and, by translating what we learn into action, to move forward with our STD goals.

Dr. Rosanna Peeling

A December 1998 survey of services offered in major laboratories across Canada revealed the following:

- 100% of the 15 laboratories responding offer culture for gonorrhea.
- 27% are moving towards use of nucleic acid amplification (NAA) tests (two of them offering probes without amplification).
- One laboratory in Newfoundland has not detected any gonorrhea isolates in two years.
- Only one-fifth provide culture for chlamydia (usually of samples from possible cases of child sexual abuse).
- 60% are performing polymerase chain reaction (PCR) and ligase chain reaction (LCR) testing for chlamydia.

- Half still carry out enzyme immunosorbent assays.
- 30% of laboratories are doing darkfield microscopy and 79% serology for syphilis.
- No laboratories offer testing for human papillomavirus.
- 79% perform culture for herpes simplex virus, and 40% do PCR on cerebrospinal fluid specimens.

In considering whether adequate laboratory tools are in place to contribute to achieving the long-term goals for STD control in Canada, three issues must be considered:

(i) How can laboratory expertise and capacity be maintained for the detection of organisms that are becoming rare?

(ii) How can laboratories adopt the newer technologies, which are particularly valuable when the STD incidence is low, without overburdening current resources?

(iii) What is the role of commercial laboratories in working towards national goals?

Dr. Peeling hoped that these questions could be borne in mind in the discussions arising during the course of the conference.

Social/Sexual Networks and National Goals

Summary

Dr. Rothenberg introduced the social network model of disease transmission, which is a street-based, ethnographic approach focusing on how individuals interact within heterogeneous groups. It involves interviewing infected individuals and all their contacts, whether in the context of drug use, sexual activity or social relationships. An adjacency matrix is a tool to plot these interactions between individuals. The model allows analysis of heterogeneous group characteristics, individual interactions within the group, network structures and characteristics, and their effect on disease spread. Dr. Rothenberg described some examples of how social network analysis has contributed to an understanding of STD transmission.

Dr. Marie-Claude Boily presented the results of a mathematical, stochastic model of HIV transmission among the heterosexual population of Montreal and the effects of chlamydia on this transmission. If the prevalence of chlamydia is set at 0.56% during 1979-1988 and 4% from 1988-1998, and the relative risk of HIV and chlamydia is 2.6, running the model many times to simulate 50 years after the introduction of HIV results in a 40% chance of HIV establishment, with an eventual maximum incidence of about 400 new infections per year. With the introduction of HIV from injection drug users (IDUs) and bisexual people into the model, the progress of the HIV epidemic changes, but the maximum incidence reached is the same. Nevertheless, HIV cannot become established in the absence of chlamydia. Thus the presence of another STD appears to be a more important factor in HIV establishment and spread in the heterosexual population than contact with IDUs and bisexual individuals.

Dr. Ann Jolly described a collaborative study in Manitoba that brought together an investigation of the sexual networks ("components") involved in gonorrhea and chlamydia transmission, and analysis of the genotypes of these pathogens. There was evidence from analysis of the components involved in chlamydia transmission that several genotypes may be present in one group, possibly indicating that these are core groups with a large number of circulating strains. A rare genotype that emerged was found to be sexually linked among three individuals within a component. Information from genotyping and the analysis of social networks complements each other and, together, can increase understanding of transmission patterns of STD.

Richard Rothenberg

Social Network Analysis: A New Research Method and a New Control Strategy

Dr. Rothenberg compared the traditional concept of disease transmission, in which disease is considered to be passed on from person to person in relatively random fashion and must be controlled (in the case of sexually transmitted diseases [STDs]) through prevention of sexual contact, with the current understanding that the nature of the social structures through which transmission takes place will affect how the disease is spread.

Two models of disease and disease transmission were introduced. The first investigates links between high risk and low risk individuals ("susceptible", "infected" and "removed"), who can be further grouped according to age, sex, ethnic background and risk status. A series of equations are generated to describe the interactions of these groups. As more and more groups are added, the number of parameters – e.g., the probability of transmission, duration of infection – increases to a point at which the various resulting interactions can become unwieldy. An example of a mixing matrix examining the interactions of people with and without HIV infection and their contacts is given in Table 1. Through this "compartment" model it is possible to make estimates of prevalence, assign probabilities to various interactions and to the transmission of disease, and generate models of group interaction.

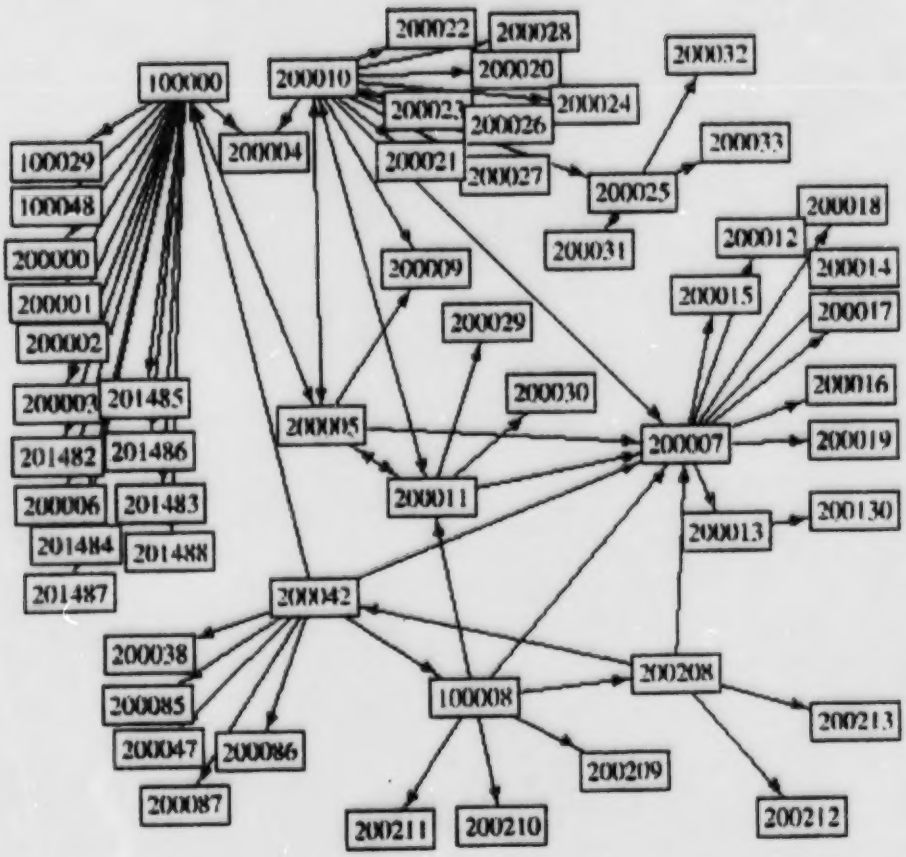
The second, social network, model is complementary to the first and provides a different perspective on the same information. It is a street-based, ethnographic approach. In the field of disease transmission, it involves interviewing of infected individuals and all their contacts, whether the context is drug use, sexual activity or social gatherings. Instead of the homogeneous group, the focus here is on how individuals interact within heterogeneous groups. In this model, an adjacency matrix may be used to plot the interactions between individuals; Figure 1 shows the social network corresponding to an adjacency matrix. The social network model allows analysis of heterogeneous group characteristics; individual interactions within that group; "multiplex" behaviour (e.g., individuals sharing sex and drugs); network structures and characteristics, and their effects on disease spread.

Table 1
By age, HIV status, and number of partners:

	HIV-negative ONE partner only		HIV-negative MORE than one partner	
Age of Respondant	Partner <30	Partner >30	Partner <30	Partner >30
18-24	0.50	0.50	0.78	0.22
25-29	0.61	0.39	0.58	0.42
	HIV-positive ONE partner only		HIV-positive MORE than one partner	
18-24	0.50	0.50	0.41	0.59
25-29	0.36	0.64	0.30	0.70

from Sawica SK, Blower SM. Proc R. Soc Lond B 1995;260:237-244

Figure 1



The social network perspective has implications for sampling and statistical analysis. As opposed to the traditional sampling methods, such as simple random sampling or sampling by stratification, social network sampling proceeds from the individual outward (to the cluster of his/her contacts), rather than from the homogeneous group of interest down to the individual. This means that the usual statistical analysis, based on the sample's representativeness of the population it is taken from, cannot be applied. An example is a snowball sample, wherein one person names several contacts, each of whom may list many others.

Some examples of the ways in which social network analysis has contributed to an understanding of STD transmission are as follows.

- **Centrality:** In Colorado Springs, where HIV rates of infection and transmission are low, most of the individuals infected with HIV were found to be not in the largest, central component of the sample studied but in smaller, peripheral groups; in contrast, the rate of infection in the central component of intravenous drug users (IDUs) studied in a New York area, where HIV infection rates are high, was 53%. It

seems that in low prevalence areas HIV-positive people are marginalized, whereas in areas of high prevalence they are central.

- **Changing risk structure:** Analysis of needle sharing in a cohort of 54 IDUs in Colorado Springs showed not only that the practice decreased in frequency over time but also that the number of connections through which it occurred decreased. In smaller, isolated groups that were sharing needles there was no substantial transmission of HIV over four years of observation.

- **Changes in risk configuration and behaviour:** Significant differences were found between the first and third year of the Colorado Springs study in risk configuration (number of potentially risky contacts) and risk behaviour (actual risk-taking behaviour). The interaction of structure and behaviour is probably one of the more important factors in disease transmission.

- **Changes in microstructure:** The structure of small groups (in which everyone is sexually connected with everyone else) has been classified according to type of clique. In Colorado Springs, cliques were found to be either unstable or diminishing over time; they were not a vehicle for the transmission of HIV in that population. In contrast, a growth in the number of these structures was observed in Atlanta over a year, during a period corresponding with active transmission of syphilis.

- **Mixing patterns and matrices:** A factor suggested to contribute to the higher rates of HIV prevalence found among African Americans than white Americans is the different pattern of sexual mixing: observations from the Atlanta study support the hypothesis that, at least in the south-eastern States, African Americans in high-prevalence areas will tend to have sex with other African Americans and that those with high levels of sexual activity will partner those with low levels.

- **Drug use typology:** Drug-using networks have been classified as closed, semi-closed, semi-open (in which people get together to buy drugs) and kinship associations. The type of network will have an influence on the extent of risk behaviours.

Dr. Rothenberg described an ethnographic analysis of a group of young people in Atlanta in whom the rate of syphilis was very high. One group of 18 teenaged women had frequent sexual contact with many members of two different groups of men, one all-white group and one composed of African Americans only. The analysis of networks provides more information about transmission than would the usual contact tracing: for instance, "bridging persons", women with syphilis who were a link between two different groups of men, were evident from the analysis, as were individuals who had two or three infected contacts but remained uninfected themselves.

A disease control strategy that follows directly from this social networks approach was carried out from March to October 1998 in Fulton County, the area in Atlanta of highest morbidity due to syphilis. A team of street-based workers developed an ethnographic base, which allowed them to get to know prominent individuals in the network and to become known themselves. They interviewed people with syphilis and their partners, and obtained information about all their contacts – sexual, social, etc. Long critical periods going back for

up to a year were used on the assumption that contacts even from long ago may provide useful information with regard to *their* contacts. The proportion of cases of syphilis found as a result of the network analysis as opposed to tracing of contacts directly from cases of syphilis was estimated to be about half. The results of the strategy in terms of disease control have yet to be determined.

The social network paradigm aims to determine the relation of structure and stability to transmission; evaluate intervention effects; map networks; and further explore network concepts in modelling. The overall goal is to understand how behaviour at the individual level relates to macro-level disease transmission.

Marie-Claude Boily

Mathematical Modelling of HIV Infection in the Heterosexual Population of Montreal

The nature of the AIDS epidemic in Montreal has been changing in recent years. The proportion of AIDS cases among heterosexuals and the absolute number of reported cases in this group has been increasing, which raises the possibility of a self-sustaining HIV epidemic in the heterosexual population.

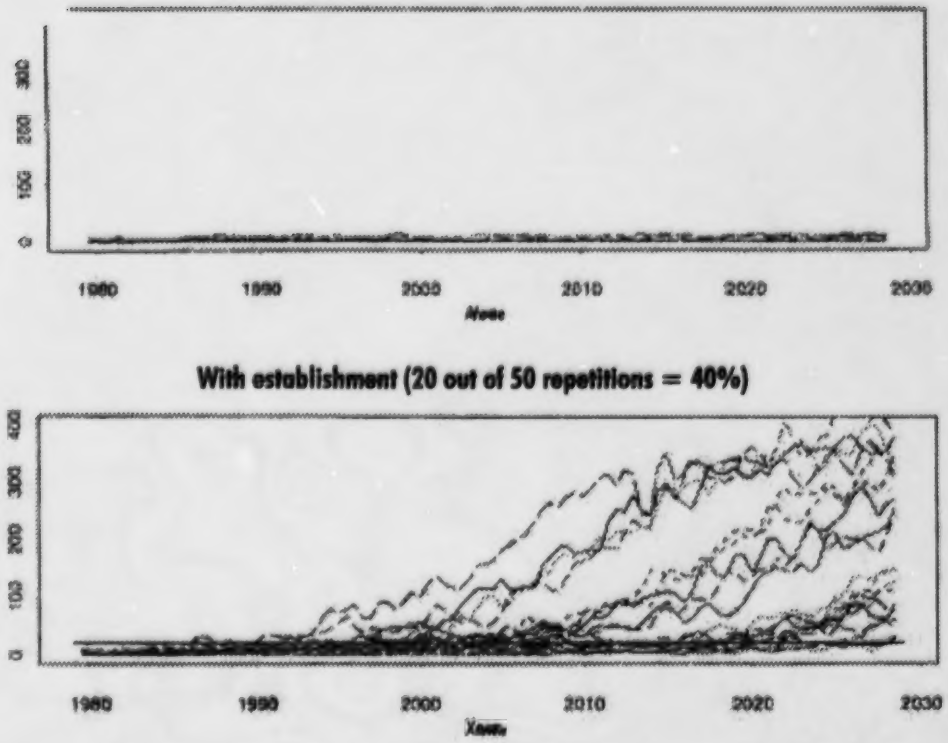
Dr. Boily presented the results of a mathematical, stochastic model developed to mimic HIV transmission among the heterosexual population of Montreal and the effects of STDs (specifically chlamydia) on this transmission.

The objectives of the study are to

- evaluate the risk of HIV-1 establishment in the strict heterosexual population (not including IDUs or bisexual individuals) of Montréal-centre
- evaluate the potential for spread
- evaluate the relative importance of STD as a risk factor for HIV establishment and spread
- identify the STD threshold conditions (e.g., type and prevalence) for HIV establishment and spread
- examine the robustness of the conclusions (e.g., whether generalizable)

The model framework includes four stages of HIV infection – the first phase highly infectious, the second of lower infectivity but longer duration, the third of medium infectivity and duration, and the fourth involving full-blown AIDS – in individuals either with or without chlamydia. The rate at which individuals move from one stage to another depends on the parameters (demographic, biologic, behavioural) inserted into the model. The initial parameters are chosen to represent a sexually active population aged between 15 and 59 years (stratified by age and sexual activity levels) with an average rate of partner change of 0.8 partners/year. The overall prevalence of chlamydia is fixed at 0.56% between 1979 (when

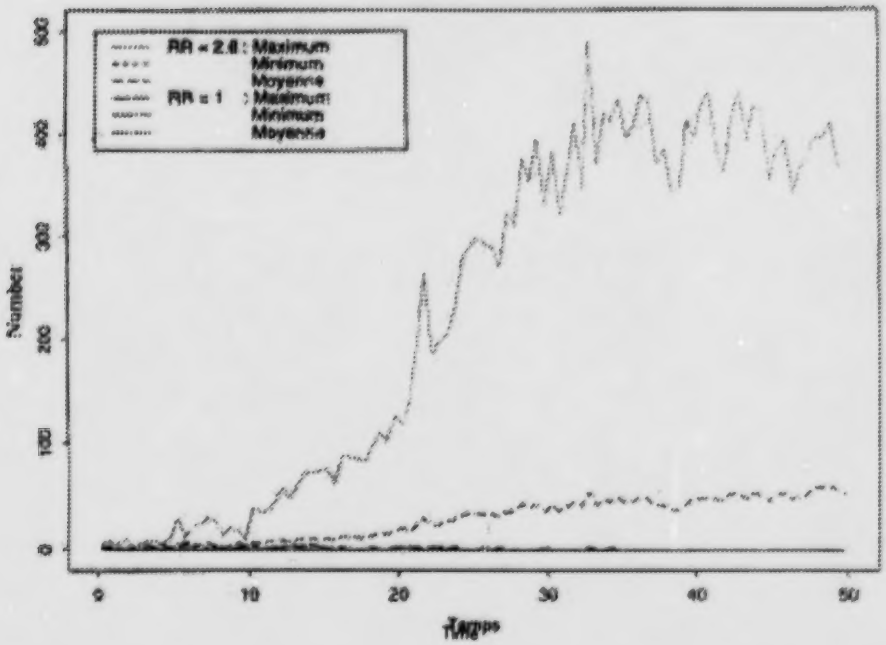
Figure 1
Course of HIV infection in the strictly heterosexual population
Number of new HIV infections per year



HIV was first reported) and 1988, and at 4% from 1988 to the present. The relative risk of HIV associated with chlamydia infection is fixed at 2.6.

When the stochastic model is run many times to simulate 50 years after the introduction of HIV, there is a 40% chance of HIV establishment (i.e., establishment in 20 out of 50 repetitions). When there is establishment (bottom panel of Figure 1), the number of new HIV infections over time is very variable. In most cases, HIV spreads slowly, and there is little evidence of an epidemic for the first 20-30 years, but eventually a maximum incidence of about 400 new infections per year is reached. The probability of establishment is very much affected by small changes in the prevalence of chlamydia: at a prevalence of 1.0% the probability is 100%, at 0.4% the probability falls to 30%, and at 0.2% it is nil. Under these conditions, if there is no STD, then there is no establishment of HIV. Thus, a minimum threshold prevalence, around 0.2%, is necessary for the association between chlamydia and HIV (with a relative risk of 2.6) to result in HIV establishment (Figure 2). Note that an increase in the prevalence of the STD contributes to an increase in the HIV maximum incidence reached as well as to the speed of the epidemic. The results of a multivariate analysis using classification tree techniques illustrate the relative importance of chlamydia as a risk factor for HIV

Figure 2
Course of HIV infection in the strictly heterosexual population
Number of new HIV infections per year
in presence of heterosexual transmission only



establishment in comparison to other behavioural and biological factors (sexual activity, condom use, mixing, transmission probabilities, etc). Figure 3 presents the results of the analysis based on 1,002 simulations each produced with different parameter sets. Each split in the classification tree shows, by hierarchical importance, the value and the risk factor that best explain the variability of the data on HIV establishment.

With the constant reintroduction of HIV from IDUs and bisexual people into the model, with 8% and 25% HIV prevalence rates respectively, the probability of establishment is 100%, the HIV epidemic unravels and peaks more rapidly, but the maximum reached is the same, at about 400 new infections per year (Figure 4). Nevertheless, HIV cannot become established in absence of chlamydia. Thus the presence of another STD appears to be a more important factor (necessary condition) of HIV establishment and spread in the heterosexual population than contact with IDUs and bisexual individuals.

Under the conditions investigated, the results suggest that there is a potential for a self-sustained HIV epidemic in Montreal, even without importation of HIV from parenteral or homosexual transmission, and that the risk is very sensitive to small changes in STD parameters (prevalence and relative risk). This has implications in terms of further preventive efforts to continue and intensify aggressive management of chlamydia and other STDs, and

Figure 3
Classification Tree, % Establishment (E)
Full sample (n=1002)

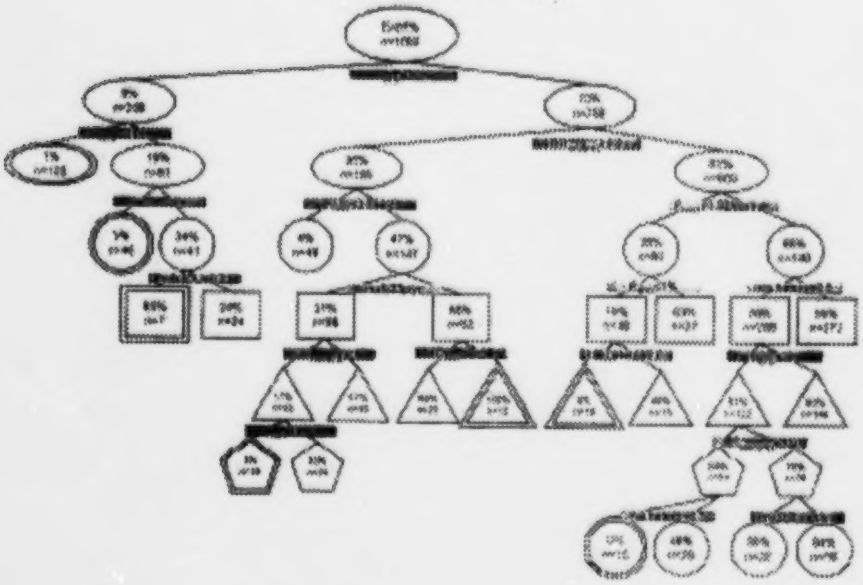
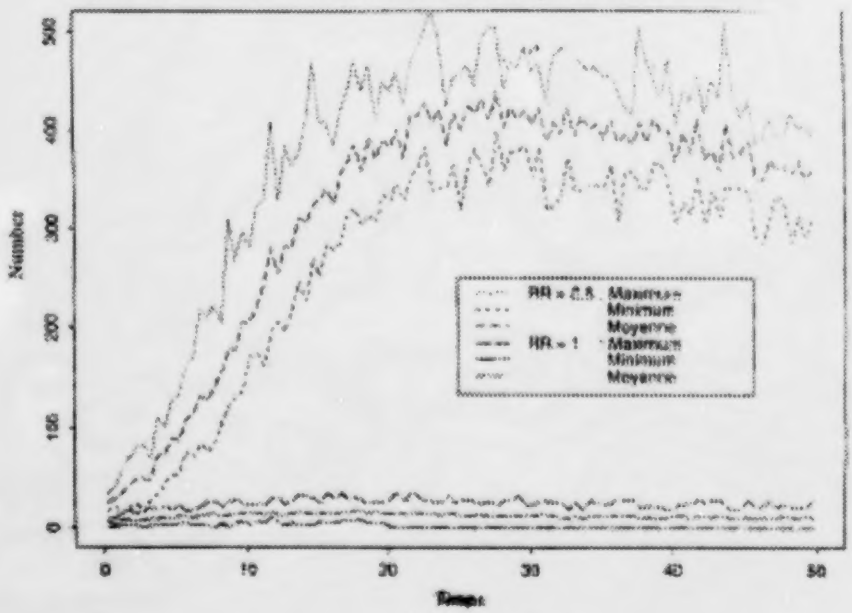


Figure 4
Course of HIV infection in the strictly heterosexual population
Number of new HIV infections per year
in presence of heterosexual, homosexual and parenteral transmissions



promote condom use, particularly among youth. To help in this endeavour, there is also a need to better characterize the STD prevalence rates and sexual behaviour of various subgroups.

Ann Jolly

Sexual Networks in Manitoba

In line with the declines in rates of bacterial STDs found across the country, the incidence of gonorrhea in Manitoba has decreased substantially from 1987 and appears now to be levelling off at fewer than 400 cases per year. As rates go down, the usual epidemiologic tools may not be appropriate to understanding the dynamics of transmission within small, core groups. This collaborative study described by Dr. Ann Jolly brought together an investigation of sexual networks vis-a-vis gonorrhea and chlamydia, and analysis of the genotypes of these bacterial pathogens.

The biological and demographic data were obtained from samples from the Cadham Provincial Laboratory, Manitoba, and information on sexual partners came from Communicable Disease Control, Manitoba Health.

The two methods of typing gonorrhea were opa typing (typing of the 11 opagenes), suggested as a sensitive method for looking at transmission between partners in close time frames, and pulsed field gel electrophoresis (using various gene types); typing of chlamydia was carried out by means of DNA sequencing. The social network analysis involved three programs (Krackplot, Ucinek and Pajek).

Routine contact tracing for gonorrhea between 1996 and 1997 led to 81 cases and contacts found in 23 components – networks of individuals connected sexually. Between 1997 and 1998, there were 4,544 cases and contacts of chlamydia in 1,705 components. Eleven of these components consisted of more than 11 people, the largest containing 82. The large groups rather than the dyads were the focus of the study.

Opa typing produced very variable results (Figure 1), whereas PFGE showed considerable consistency within components (Figure 2). There was also evidence of geographic concordance: the same genotype was found in component 12 and component 8, two groups located in an isolated area 300 km north of Winnipeg.

Figure 3 shows the components in the chlamydia network. The dots represent groups of people and range in size from small groups of 2 or 3, to the largest of 30 or more. Thin lines linking the components denote one sexual link, thicker ones two to three links, and the thickest line 23 sexual links (connecting Winnipeg with communities in the north). Some contacts came from Saskatchewan, Ontario and British Columbia.

Analysis of individual chlamydia networks showed that often the individuals within them came from different geographic areas. This has implications for disease control, in that a centralized database that can capture information on all contacts may be necessary rather

Figure 1
Results of opa typing

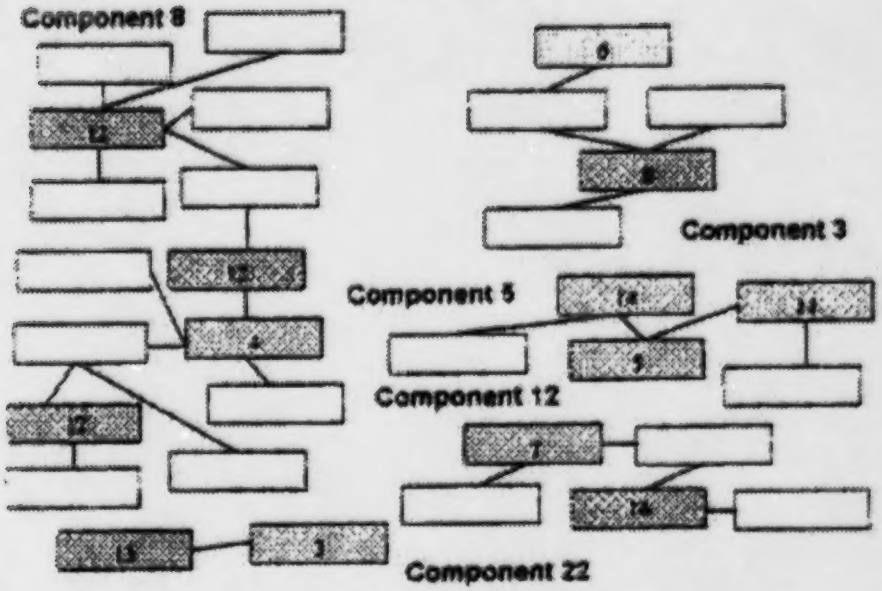


Figure 2
Results of PFGE

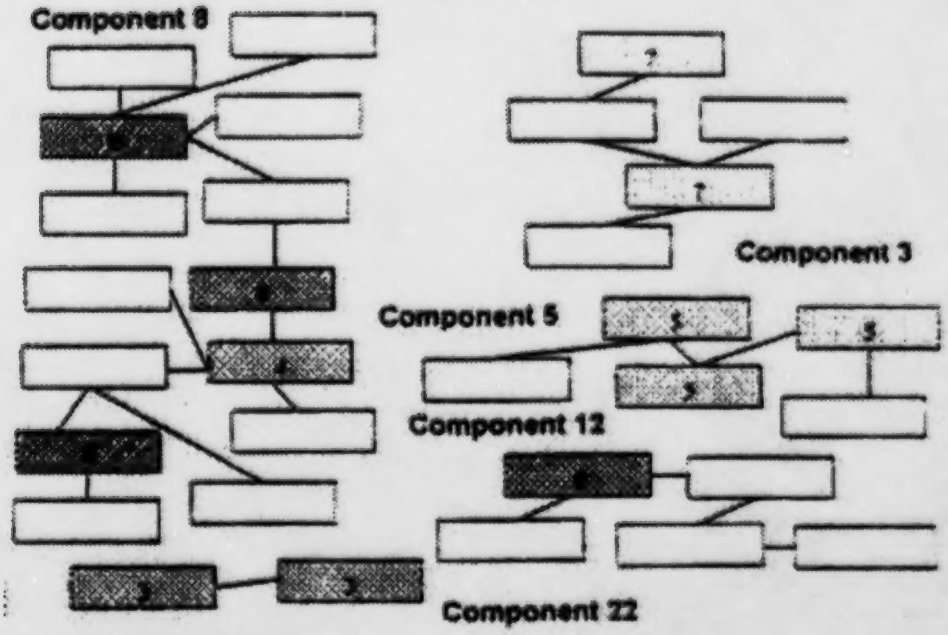
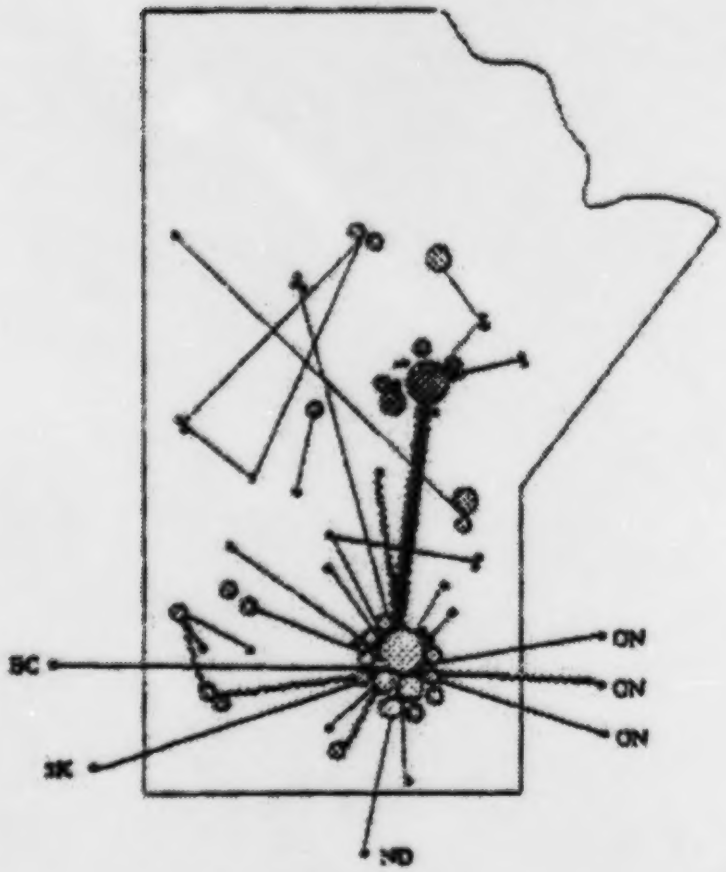


Figure 3
Chlamydia networks in Manitoba



than a reliance on local management of STD. There is also evidence from analysis of components that several genotypes may be present in one group, possibly indicating that these are core groups with a large number of circulating strains. A rare genotype that emerged was found to be sexually linked among three individuals within a component.

Laboratory typing becomes more important as resistant strains of bacterial pathogens continue to emerge; it is useful in differentiating more or less virulent strains of chlamydia; and it may reveal gaps in contact information, for example, by raising questions about a rare genotype that occurs in apparent isolation. Sexual network analysis provides a more sensitive indicator of genotype and transmission than does analysis by geographic area. Information from genotyping and the analysis of sexual networks complement each other; together, they will further the knowledge of transmission patterns and therefore guide intervention and prevention efforts.

Panel Discussion

There was discussion about the role of STD control in preventing transmission of HIV and the possibility that it can be a more effective tool early on in the HIV epidemic, when transmission is taking place in high-risk groups and the efficiency of transmission is crucial. It was felt that the dynamics of STD spread and the interaction with HIV have implications for our national goals: although rates of STDs have been in decline, such factors have the potential to change that situation dramatically. The question was raised as to whether social network methods, although valuable in tracking the spread of infection and delineating high-risk groups, might send the wrong message to the public, i.e., that interacting with "safe" groups of people is sufficient protection against STDs. There was discussion about the extent of public education on HIV and the need to target people at high risk of STDs or the wider population.

Surveillance and National Goals

Summary

Ms. Robbi Jordan provided details from *Sexually Transmitted Diseases in Canada: 1996 Surveillance Report (with preliminary 1997 data).* The breakdown of bacterial STDs reported to LCDC in 1996 was as follows: genital chlamydia 85%, gonorrhea 13% and syphilis 2%. Annual incidence rates of chlamydia and gonorrhea have continued to decline: the chlamydia rate in 1996 was 114.8 per 100,000 (estimated rate in 1998, 99.8 per 100,000, goal for the year 2000 set at < 80 per 100,000); and for gonorrhea the 1996 incidence rate was 16.8 per 100,000 (goal for the year 2010 is elimination). The rate of infectious syphilis in 1996 was 0.4 per 100,000, in line with the maintenance goal of < 0.5 per 100,000 by the year 2000. Incidence rates of cervical cancer (considered an indicator of the prevalence of human papillomavirus [HPV]) dropped to 8.7 per 100,000 in 1998, possibly as a result of increases in Pap smear testing. Although hospital discharge rates for pelvic inflammatory disease (sequela of chlamydia and gonorrhea) fell to 126 per 100,000 in 1996, this is known to be a substantial underestimate.

Provincial/territorial surveillance: In **Prince Edward Island** the number of reported cases of chlamydia has increased slightly in the last three years, at 150 during 1998-99. One case of gonorrhea and no cases of syphilis were reported during 1998-99. Two people tested positive for hepatitis B in 1997-98, and at present there are 33 known cases. From 1990 to 1998 a diagnosis of hepatitis C was made in 196 patients, and a history of injection drug use or blood transfusion was found in 87% of these. There are 36 people infected with HIV, 20 of them with a diagnosis of AIDS.

In **New Brunswick** the incidence rate of chlamydia increased slightly during 1998, to 121 per 100,000 from 107 per 100,000 in 1997. Gonorrhea rates increased considerably during 1996 and 1997 (5.9 and 6.2 per 100,000 respectively, as compared with 1.8 per 100,000 during 1995), possibly as a result of the introduction of NAAT. Overall rates of genital herpes from 1992 to 1998 have ranged from 20 to 26 per 100,000.

In **Quebec** there was a slight increase in the incidence of chlamydia between 1997 and 1998, from 87 to 96 per 100,000, possibly as a result of the introduction of PCR testing. The incidence of gonorrhea and the number of penicillinase-producing *Neisseria gonorrhoeae* (PPNG) cases have also gone down during the 1990s, with only one resistant

case reported during 1997 and 1998. Rates of acute hepatitis B and syphilis have been decreasing.

In **Ontario** the incidence rate of chlamydia rose slightly during 1998, possibly because of better screening methods and partner notification. Gonorrhea rates are low and similar to the national rates. In 1997 there were 32 cases of syphilis. Rates of hepatitis B continue to decline. EIA testing for chlamydia was phased out at the Central Public Health Laboratory by the end of 1997 and replaced by Abbott Laboratories LCx technology. Culture is still being used to test for gonorrhea. The proportion of PPNG isolates declined from 7.2% of total specimens tested in 1997 to 3.0% in 1998.

In **Manitoba** there were 3,130 cases of chlamydia during 1998 (including 99 in the 10-14 year age group). The incidence rate increased slightly during 1998, an expected finding after Genprobe 2 was introduced to test for chlamydia in 1997. The slight upturn in the number of gonorrhea cases in 1998 also occurred after testing with Genprobe 2 began. Two cases of infectious syphilis were reported in 1998.

In **Saskatchewan** polymerase chain reaction (PCR) techniques were introduced in 1995 to test for chlamydia, and the proportion of positive test results in men increased from 12% to 16%. In 1998, a total of 1,121 cases of chlamydia were reported. The number of cases of gonorrhea is down to fewer than 400 annually. There have been a few outbreaks of syphilis in the last decade, after which the incidence has returned to fairly low levels. The number of cases of genital herpes has been fairly steady, at about 300 cases per year.

In **Alberta** there was an increase in chlamydia incidence between 1997 and 1998, from 163 to 188 per 100,000. This was not due to changes in laboratory technology, since enzyme immunoassay (EIA) is still the testing method used. Incidence rates of gonorrhea increased in 1998 to 19 per 100,000, possibly as a result of the use of Genprobe in one private laboratory. There were six cases of infectious syphilis during 1998. The overall number of HIV infections has not changed substantially, but transmission now takes place predominantly through injection drug use and heterosexual contact.

In the **Northwest Territories** rates of chlamydia are higher in Nunavut than in the Western NWT, and there was a 30% increase in incidence in Nunavut after ligase chain reaction (LCR) testing was introduced at the beginning of 1997. The number of gonorrhea cases in the Western NWT increased by 98% between 1997 and 1998 with the new LCR technology. No cases of syphilis have been reported since 1988. A large number of cases of hepatitis C have been diagnosed in Yellowknife over the past five years as screening programs have been intensified.

In **British Columbia** the chlamydia rate increased in 1998 to 120 per 100,000, coinciding with the introduction of PCR testing methods in 1997. The incidence of gonorrhea, too, increased in 1998, to 14 per 100,000, although NAAT has not been used. There were 504 cases of HIV infection reported during 1998, a decline associated primarily with the decrease in the number of newly diagnosed IDUs. There has been an outbreak of infectious syphilis, beginning in mid-1997 (1.3 per 100,000) and continuing to the present (2.9 per 100,000 by the end of 1998). It is confined to Vancouver and Richmond, and appears to be related to the sex trade in the downtown east side of Vancouver.

Robbi Jordan

National Surveillance Report

Ms. Jordan provided details from *Sexually Transmitted Diseases in Canada: 1996 Surveillance Report (with preliminary 1997 data)*. With regard to the bacterial STDs, genital chlamydia represented 85% of disease reported to LCDC in 1996, gonorrhea accounted for 13% and syphilis for 2%.

Incidence rates of genital chlamydia have been decreasing among both sexes: the rate overall fell from 171.7 per 100,000 in 1991 to 114.8 per 100,000 in 1996 (Figure 1). The trend is steeper among females, probably because changes in testing methods for males have resulted in more efficient case-finding. The goal for the year 2000 was set at < 80 per 100,000, and the rate in 1998 (preliminary data) was 99.8 per 100,000. Chlamydia rates were highest among females in the 15-19 and 20-24 year age group (Figure 2). The male:female ratio in the age group 15-19 years was 1:7. The national goal was set at < 500 per 100,000 for females in the 15-24 year age group, and the female rate in 1996 was 968 per 100,000. With regard to geographic distribution, rates of genital chlamydia were lowest in Newfoundland in 1996 and highest in the Northwest Territories, where the rate among females was 2047.1 per 100,000.

There was a continuing decrease in rates of gonorrhea between 1980 and 1997 (Figure 3), from 216.6 to 16.8 per 100,000 (13 per 100,000 from preliminary 1998 data). The goal of gonorrhea elimination was set for the year 2010. The incidence was highest among females aged 15-19, and in this age group the male:female incidence ratio was 1:2.5; the male incidence was highest in the 20-24 year group. Distribution by province was much the same as for chlamydia.

Figure 1
Reported Genital Chlamydia, 1991 to 1998

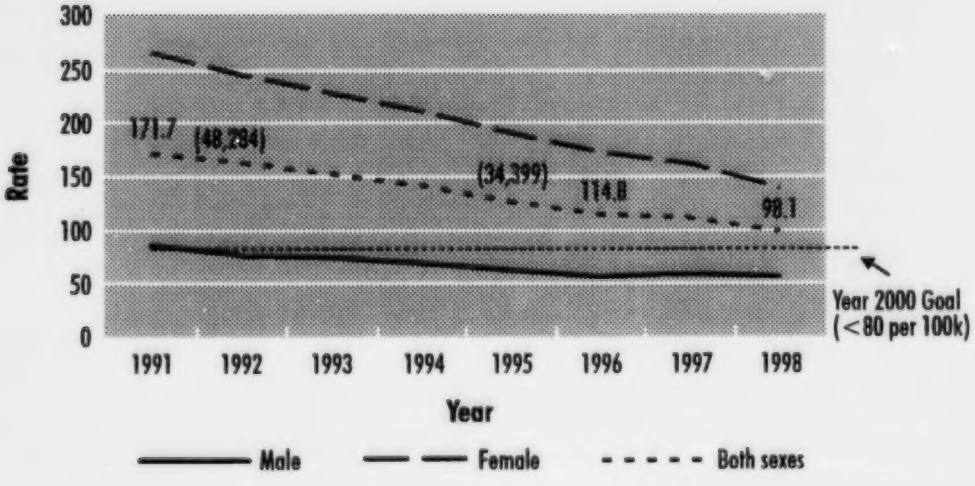


Figure 2
Reported Genital Chlamydia Rates in Canada by Age Group and Sex, 1996

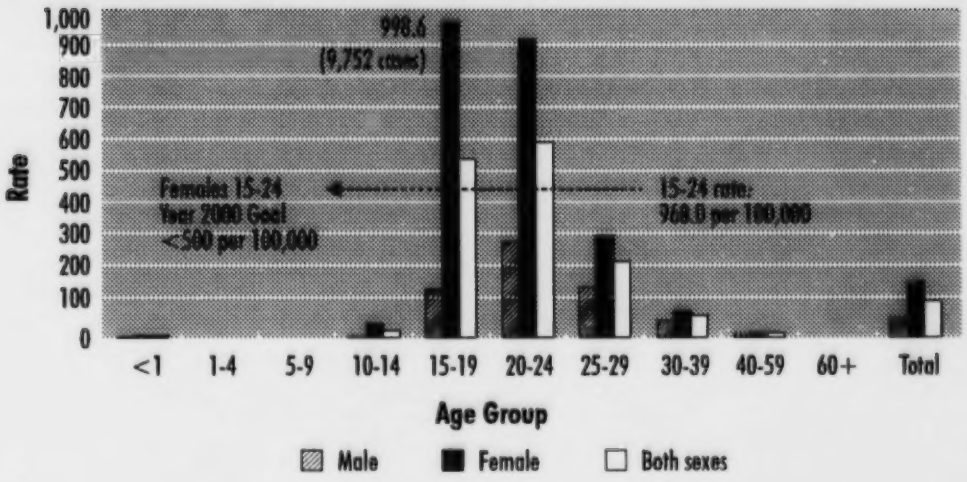
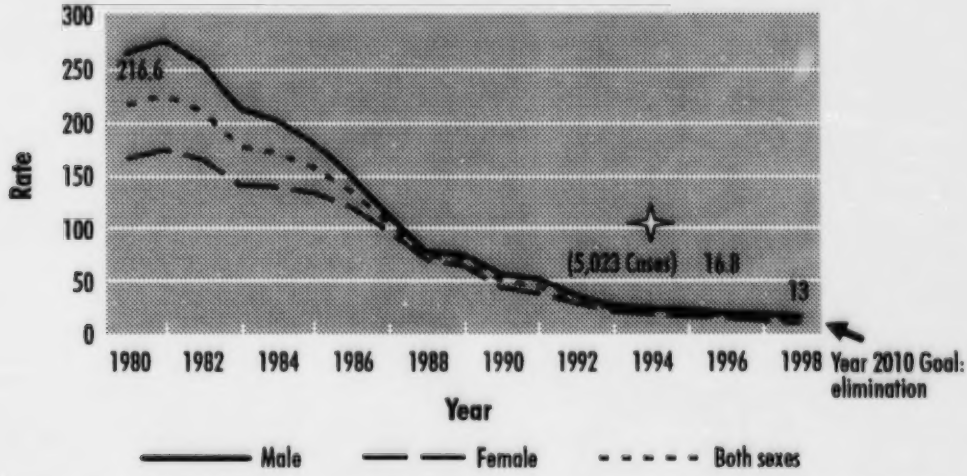


Figure 3
Reported Gonorrhea in Canada, 1980 to 1998



Since 1993, LCDC has been reporting syphilis cases according to their infectiousness. Infectious syphilis comprises early symptomatic (primary and secondary) syphilis and early latent syphilis. The rate of infectious syphilis in 1996 was 0.4 per 100,000 (Figure 4) or 123 cases, in line with the maintenance goal of < 0.5 per 100,000 by the year 2000.

Among both males and females the age group most affected by infectious syphilis was the 25-29 year group, at 1.2 and 1.3 per 100,000 among males and females respectively.

Incidence rates of cervical cancer are often used as an indicator of the prevalence of HPV. Figure 5 shows the incidence and mortality rates associated with cervical cancer from 1985 to 1998. The mortality rate has remained fairly stable over this period, while the incidence

Figure 4
Infectious Syphilis in Canada, 1993 to 1998

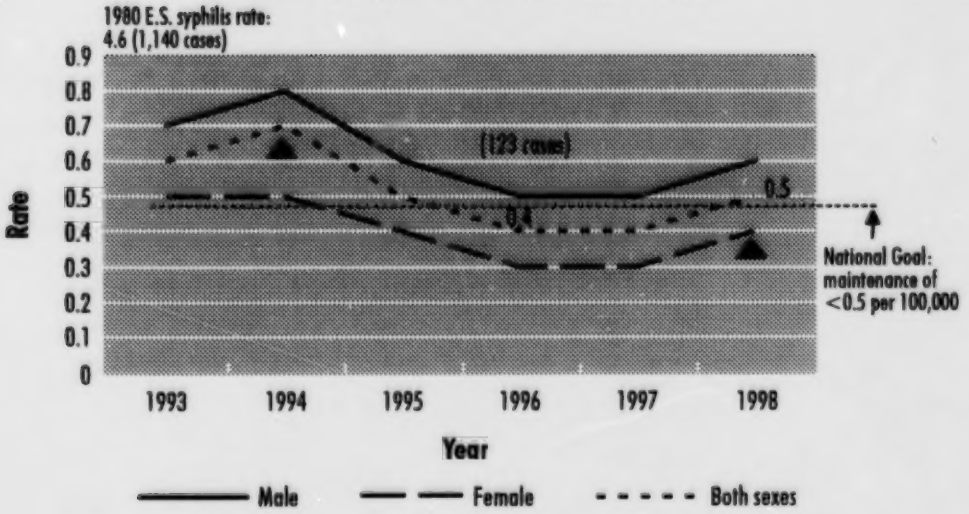
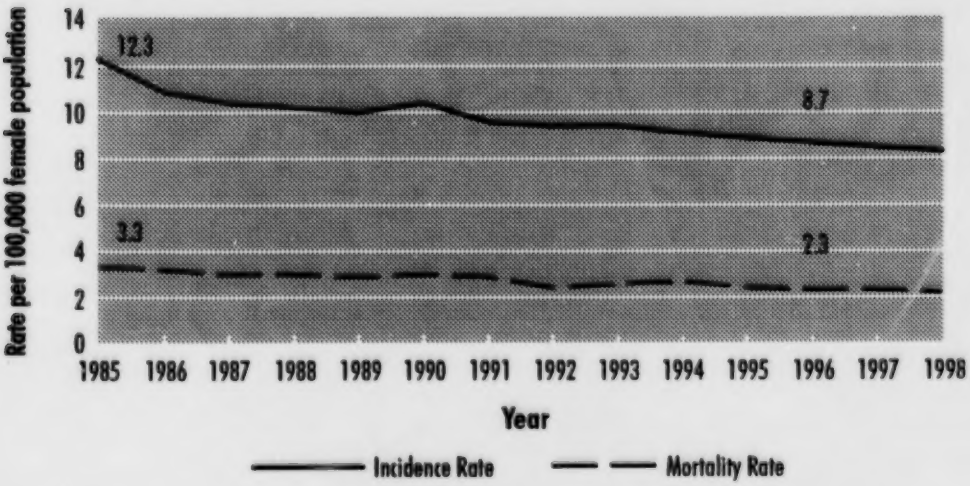


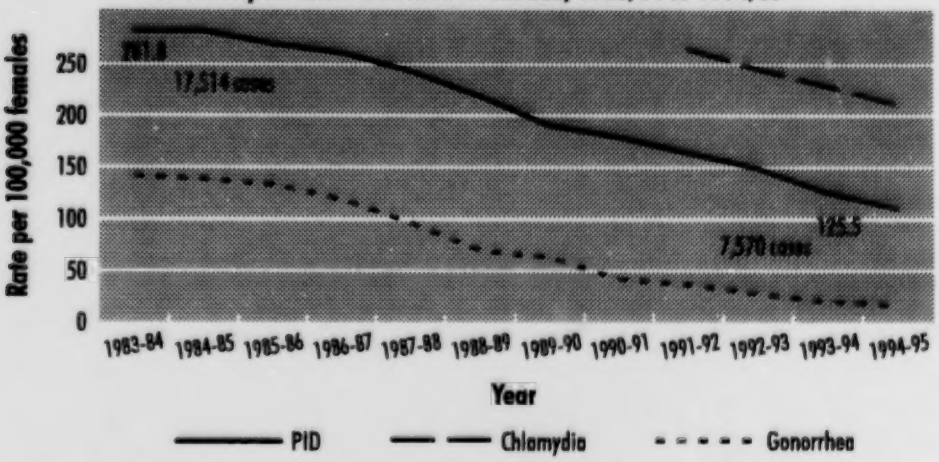
Figure 5
Cervical Cancer: Incidence and Mortality per 100,000 Females, Canada, 1985-1998



rate has dropped to 8.7 per 100,000 females in 1998, possibly as a result of more Pap smears being tested.

With regard to pelvic inflammatory disease, Figure 6 shows how rates of hospital discharge for PID mirror the incidence of chlamydia and gonorrhea. About 85% of cases of PID are not treated on a hospital in-patient basis, however, and therefore the rates are probably greatly underreported. The rate has decreased from 281.8 in 1983-84 to 125.5 per

Figure 6
Rates of Hospital Discharges for Pelvic Inflammatory Disease and Incidence of Chlamydia and Gonorrhea in Canada, 1983/84 to 1994/85



100,000. Rates of ectopic pregnancy increased between 1986 and 1993, from 11.7 to 16.9 per 100,000.

A comparison of Canadian and US data shows that rates of genital chlamydia dropped in Canada from 1991 to 1997 and in the United States have been increasing slightly. The increase is attributed by the Centers for Disease Control and Prevention to increased screening, recognition of asymptomatic women and improved reporting as well as to disease. The downward trends in gonorrhea incidence were very similar in the two countries between 1980 and 1997. The US rate in 1997 was 123.1 and the Canadian rate was 16.8 per 100,000. Canadian rates of early symptomatic (primary and secondary) syphilis are one-tenth those of the United States. Nevertheless, in the United States a national syphilis elimination program has already been initiated.

Sexually Transmitted Diseases in Canada: 1996 Surveillance Report will soon be available in hard copy and on the Division's Web site. The appendices will be available in spreadsheet format.

Marie Morris

Prince Edward Island

In Prince Edward Island, cases of STD are reported to the Chief Officer of Health and followed up by public health nurses in the five health regions of PEI.

There has been a slight increase in the number of reported cases of chlamydia during the last three years, up to 150 during 1998-99. One case of gonorrhea was reported and no cases of syphilis for the period 1997-98 (Table 1).

Table 1 STD Statistics — Province of Prince Edward Island			
Year	Chlamydia	Gonorrhea	Syphilis
1987-88	106	32	2
1988-89	223	22	1
1989-90	205	15	0
1990-91	223	10	1
1991-92	231	5	0
1992-93	183	1	0
1993-94	166	0	0
1994-95	120	0	0
1995-96	107	0	0
1996-97	140	1	0
1997-98	145	2	0
1998-99	150	1	0

Table 2 Hepatitis B Positive Tests – P.E.I. 1990-1997				
Year	Acute Hepatitis	Test+, No Symptoms	Test +, Pregnancy Screening	Total
1990	0	2	0	2
1991	0	1	1	2
1992	0	6	1	7
1993	2	6	0	8
1994	0	2	3	5
1995	1	2	0	3
1996	0	0	0	0
1997	0	4	0	4
1998	0	2	0	2
Total	3	25	5	33

Two people tested positive for hepatitis B in 1997-98, and at present there are 33 known cases on the island (Table 2). Between 1990 and 1998 there were 196 patients with a diagnosis of hepatitis C: 47% had a history of injection drug use, and 40% had a possible or confirmed blood transfusion history. Table 3 shows the breakdown of documented blood or blood product transfusion according to year.

One case of AIDS was diagnosed in 1998, down from three the year before. At present, AIDS has been diagnosed in 20 residents of PEI, and an additional 16 have tested positive for HIV but do not have symptoms of disease. About 26 of these 36 people probably acquired the virus from homosexual or bisexual contact, 5 from blood or blood products,

or through mother to infant transfer, 3 from heterosexual contact and 1 from intravenous drug use.

Table 3 Hepatitis C Statistics, December 22, 1998	
Total number of cases reported	196
Number with iv drug history	92 (46.9%)
Number with confirmed or possible blood transfusion history	79 (40.0%)
Note: a number of cases are still under investigation and the risk factor is not yet determined	
Received blood products	16
• Generally assumed that they would have received product in all the periods under consideration including: 1) before 1984; 2) 1984-1986; 3) 1986-June 1, 1990; and 4) after June 1, 1990	
Blood or blood product recipients with documentation of transfusion	46
• Received 1) only before 1984	11
• 2) only 1984-1985	8
• 3) only 1986-June 1, 1990	12
• 4) only after June 1, 1990	7
• Periods 1) and 2)	2
• Periods 1) and 3)	1
• Periods 2) and 3)	2
• Periods 1), 2), 3) and 4)	1
• Periods 3) and 4)	3
• In period 3) with or without another period	19
Blood or blood products without documentation of definite transfusion	17
• 1) only before 1984	11
• 2) only 1984-1985	3
• 3) only 1986-June 1, 199	0
• 4) only after June 1, 1990	3
• 5) those in more than one period	0

Ivan Brophy

New Brunswick

The predominant reporting of chlamydia cases in New Brunswick is in the 15-19 and 20-24 year age groups. Cases and rates from 1992 to 1998 are shown in Table 1: the overall rate has been decreasing during the 1990s. However, there has been an increase in reported cases during 1998.

The number of cases of gonorrhea for all ages increased considerably during 1996 and 1997 (Table 2), most of the increase occurring in one of the seven public health regions. It is not clear whether this is related to a change in laboratory methodology in this particular region. However, there has been a decrease in the number of reported gonorrhea cases in 1998.

Table 1
Reported Cases and Rates (/100,000 pop.) of Chlamydia in New Brunswick During the Years 1992 to 1998* , by Selected Age Groups and Gender

Age Groups	1992		1993		1994		1995		1996		1997		1998*		Year 2000 Target
	M/F		M/F		M/F		M/F		M/F		M/F		M/F		
15-19	31	368	25	318	29	305	25	225	35	251	25	255	41	309	
Rates	*104*	*1290*	*86*	*1141*	*102*	*1121*	*89*	*848*	*128*	*967*	*96*	*1005*	*153*	*1218*	
20-24	113	489	95	403	87	324	75	281	77	300	96	247	101	273	
Rates	*376*	*1703*	*316*	*1400*	*291*	*1131*	*254*	*985*	*266*	*1071*	*342*	*909*	*359*	*1005*	
All Ages	1339		1066		917		798		833		818		925		
Rate/Province	*183.9*		*142.0*		*120.8*		*105.0*		*109.3*		*107.3*		*121.4*		*112.0*

* provisional data
Prepared by the Provincial Epidemiology Service

Table 2
Reported Cases (and Rate for Province/100,000 pop.) of Gonococcal Infections in New Brunswick During the Years 1992 to 1998* , Selected Age Groups

Age Groups	1992	1993	1994	1995	1996	1997	1998*	Year 2000 Target
15-19	2	0	6	5	16	10	7	
20-24	9	3	2	4	11	16	4	
25-29	5	3	2	0	3	9	2	
30-39	7	2	3	5	13	10	6	
All ages	24	8	13	14	45	47	21	
Rate/Province	*3.3*	*1.1*	*1.7*	*1.8*	*5.9*	*6.2*	*2.8*	*1.2*

* provisional data
Note: rates in 15-24 year olds were 51.7, 49.9 and 21.1 for years 1996, 1997 and 1998 respectively

In the past three years there have been no cases reported of early symptomatic syphilis (Table 3) in New Brunswick, and few cases were reported in the three previous years.

Table 4 presents numbers of cases and rates of reported genital herpes from 1992 to 1998. Overall rates range from 20 to 26 cases per 100,000.

Table 3
Reported Cases and Rates (/100,000 pop.) of Early Symptomatic Syphilis in New Brunswick During the Years 1989 to 1998*

Year	Reported Cases	Rate/100,000
1989	19	2.6
1990	16	2.2
1991	12	1.7
1992	16	2.2
1993	0	0.0
1994	5	0.7
1995	1	0.1
1996	0	0.0
1997	0	0.0
1998	0	0.0

* provisional data
Prepared by the Provincial Epidemiology Service

Table 4
Reported Cases and Rates (/100,000 pop.) of Genital Herpes in New Brunswick During the Years 1992 to 1998*

Age Groups	1992		1993		1994		1995		1996		1997		1998		Year 2000 Target
	M/F		M/F		M/F		M/F		M/F		M/F		M/F		
15-19	1	12	2	22	1	21	4	15	0	23	1	18	0	21	
Rates	*3*	*42*	*10*	*79*	*4*	*77*	*14*	*57*	*0*	*89*	*4*	*71*	*0*	*83*	
20-24	4	28	11	32	0	37	4	44	11	38	4	50	5	40	
Rates	*13*	*98*	*37*	*111*	*27*	*129*	*14*	*154*	*38*	*136*	*14*	*184*	*18*	*147*	
25-29	10	17	7	24	8	22	17	21	5	24	6	28	6	18	
Rates	*31*	*54*	*23*	*79*	*27*	*76*	*59*	*74*	*17*	*85*	*21*	*100*	*21*	*64*	
30-39	0	15	16	21	0	10	13	27	15	28	13	34	14	30	
Rates	*14*	*23*	*25*	*33*	*14*	*29*	*20*	*42*	*23*	*44*	*20*	*54*	*22*	*47*	
All ages					39	114	53	135	49	139	36	158	40	141	
Rate					*10*	*30*	*14*	*35*	*13*	*36*	*10*	*41*	*10*	*37*	
Rates/Province					*20*		*25*		*25*		*26*		*24*		

* provisional data
Prepared by the Provincial Epidemiology Service

Nicole Turcotte

Quebec

There was a slight increase in rates of chlamydia in 1998 (Figure 1), possibly as a result of the introduction of PCR testing. The rates are higher among females, and the age groups most affected are 15-19 and 20-24 year-olds. The incidence of gonorrhea, for which PCR is not used, declined from 1990 to 1998 (Figure 2). The number of penicillinase-producing *Neisseria gonorrhoeae* (PPNG) cases reported has also gone down during the 1990s, with only one resistant case reported during 1997 and 1998. The incidence of acute hepatitis B has been consistently declining (Figure 3). Although a vaccination program has been introduced for 4th grade children, this cannot explain the current reduction. Syphilis has also been found to be decreasing, and by 1998 very few cases were reported (Figure 4).

Figure 1
Chlamydia Incidence Rate by Gender, Québec, 1990-1998

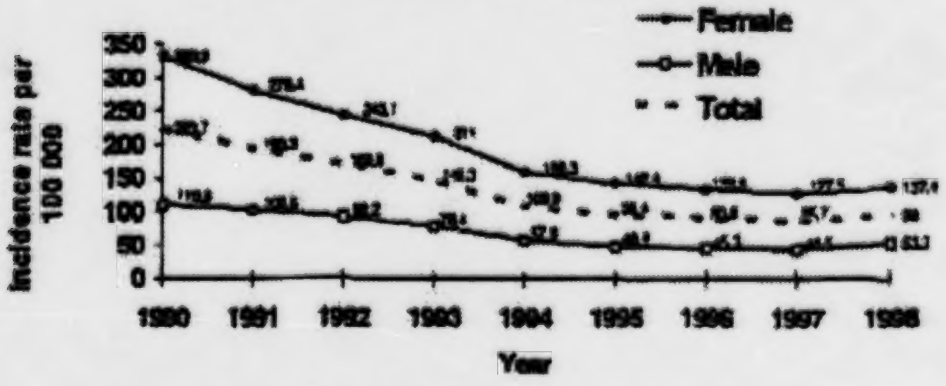


Figure 2
Gonorrhoea Incidence Rate by Gender, Québec, 1990-1998

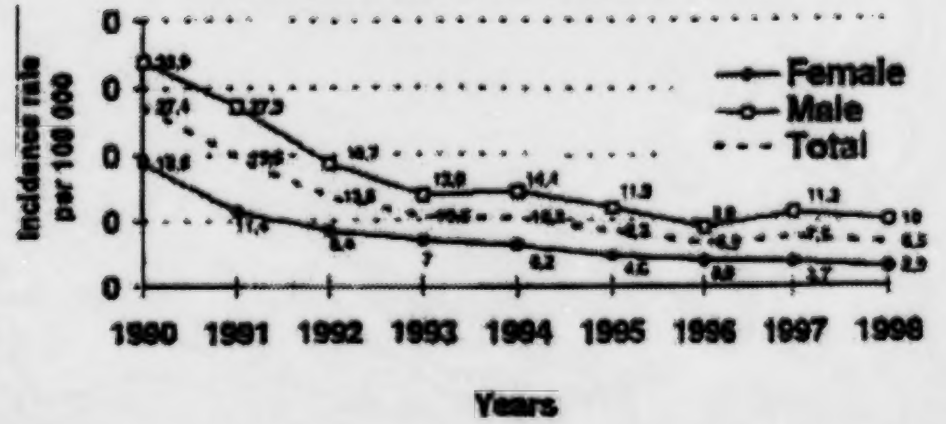


Figure 3
Acute hepatitis B Incidence Rate by Gender, Québec, 1990-1998

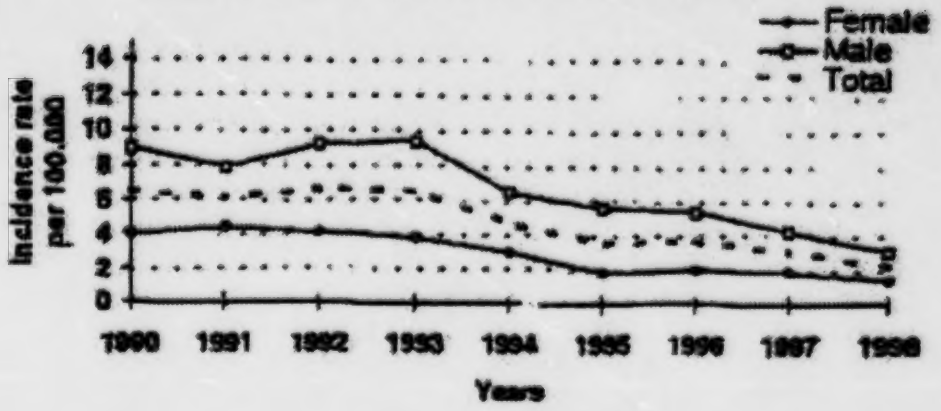
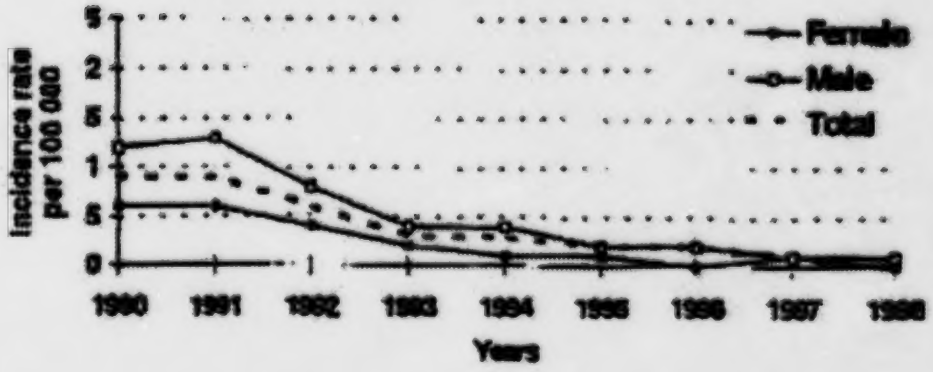


Figure 4
Early Syphilis, Incidence Rate, Québec, 1990-1998



In 1992 free treatment of STDs was introduced in Quebec. The proportion of people treated by the program decreased by 14% from 1993 to 1997.

The STD Advisory Committee is active in the following areas:

- STD testing: positivity rate surveillance pilot project in progress
- Partner notification: recommendations to come
- Screening: advice to regional public health authorities
- Epidemiologic surveillance: implementation of standardized questionnaire
- General population information: InfoHealth

Lorraine Schiedel, Gerald Blackwell

Ontario

Lorraine Schiedel

Chlamydia rates have been declining over the years in Ontario (Figure 1). The pattern is similar to that in other provinces, with the age groups 15-19 and 20-24 being most affected by the disease (Figure 2). During 1998 the rates gradually increased, and this may be a result of better screening methods and partner notification. Gonorrhea rates were low and similar to the national picture; Figure 3 shows the breakdown by age group and sex for

Figure 1
Chlamydia, Ontario, 1988-1997

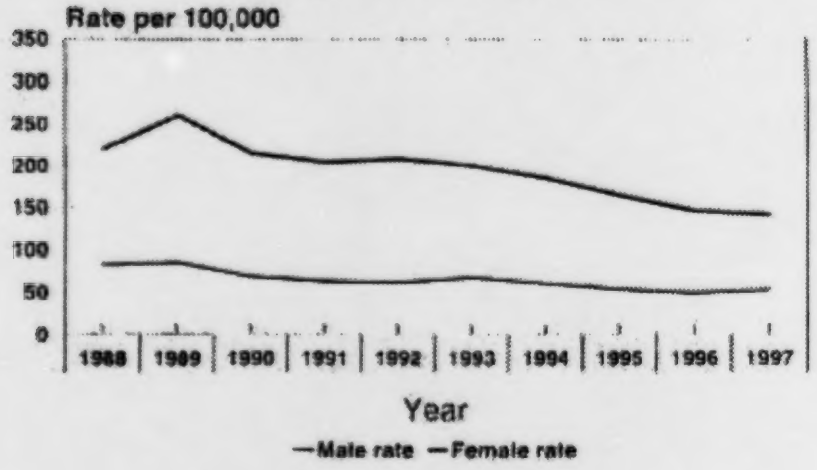


Figure 2
Chlamydia by Age and Sex, Ontario, 1997

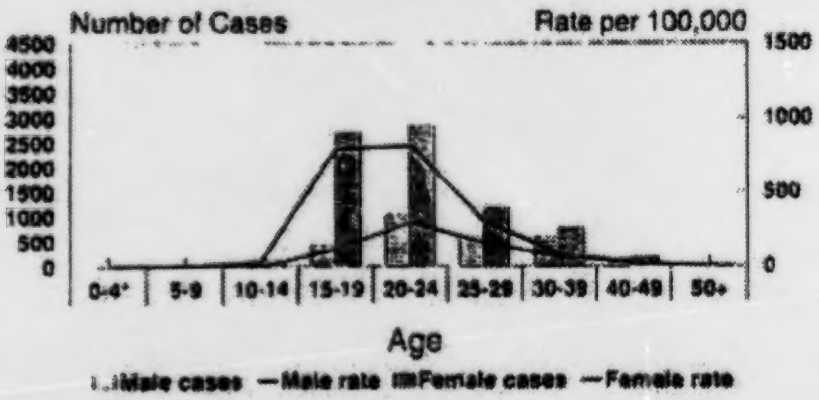


Figure 3
Gonorrhea by Age and Sex, Ontario, 1997

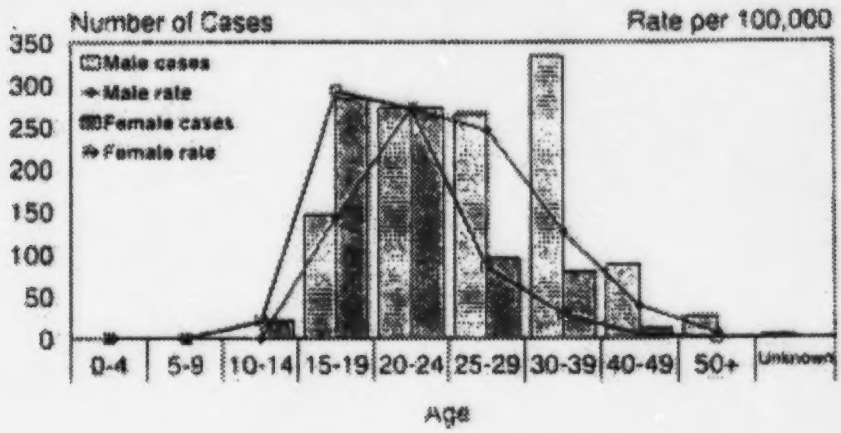
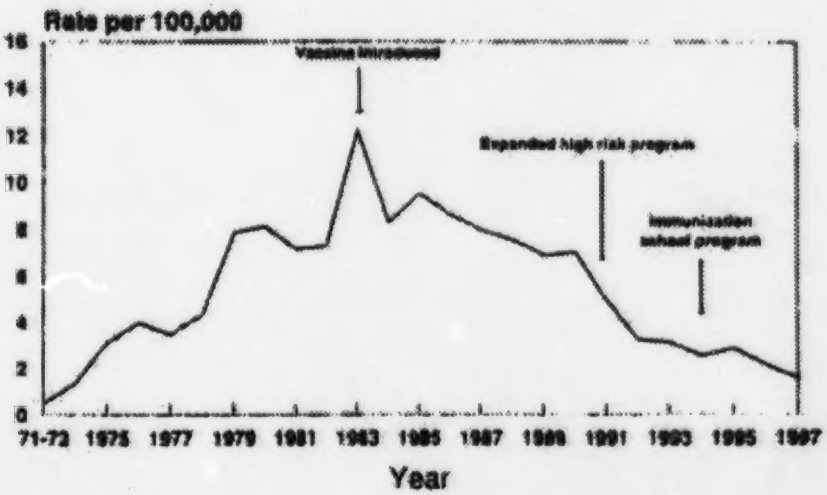


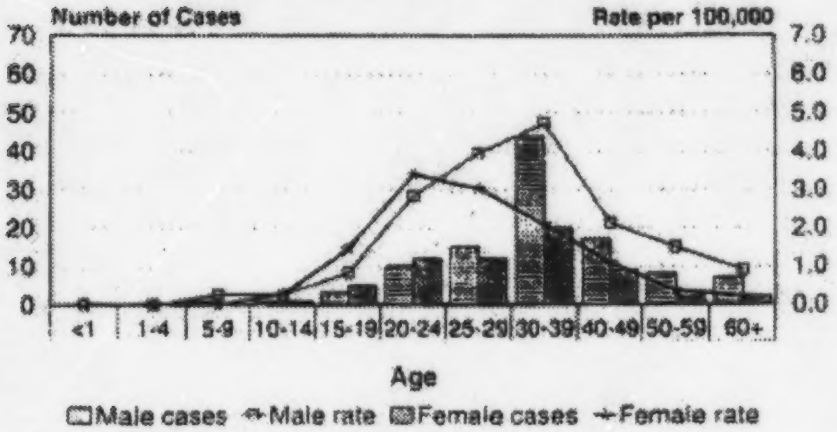
Figure 4
Hepatitis B, Ontario, 1971-1997



1997. The incidence of syphilis, too, has been declining; in 1997 there were 32 cases, 20 of them in males.

Hepatitis B rates have been falling over the years. Figure 4 shows the effect of vaccine introduction, expanded high-risk programs and vaccination programs in schools. Hepatitis B rates by age and sex are shown in Figure 5.

Figure 5
Hepatitis B by Age and Sex, Ontario, 1997



Gerald Blackwell

Data on the tests carried out for *Chlamydia trachomatis* at the Central Public Health Laboratory, Etobicoke, between 1995 and 1998 are presented in Table 1. The number of specimens tested has been relatively similar over these years, and the proportion of positive results from culture has decreased. Enzyme immunoassay (EIA) was phased out by the end of 1997 and replaced by Abbott Laboratories LCx technology. As in Quebec, the change in testing method has been accompanied by an increase in positivity. Over all testing methods, the proportion of positive results from 1995 to 1998 was 3.1%, 3.0%, 3.2% and 3.8% respectively.

Culture is still being used to test for *Neisseria gonorrhoeae*. Table 2 shows the results of testing from 1996 to 1998.

Table 1
***Chlamydia trachomatis* Testing**

	Culture			EIA (Syva)			LCx ABBOTT		
	Spec. Tested (McCoy)	Spec. Pos	% Pos	Spec. Tested by EIA (Syva)	Spec. Pos	% Pos	Spec. Tested byLCx (Abbott)	Spec. Pos	% Pos
1995	6678	159	2.3	21322	717	3.3			
1996	4472	76	1.7	18464	575	3.1			
1997	2955	35	1.2	21517	662	3.0	176	11	6.3
1998	5796	50	0.9	2745	92	3.4	20508	956	4.7

Table 2 *Neisseria gonorrhoeae* Isolates from Culture			
Year	Total specimens received	# of positives	% positives
1996	15472	196	1.27%
1997	16242	185	1.14%
1998	17632	255	1.45%

Pat Matusko

Manitoba

In 1998 there were 3,130 cases of chlamydia. Figure 1 presents the incidence rate by age group and sex for that year, and confirms the common finding that 15-24 year-old females are the group most at risk. Of some concern is that there were 99 cases of chlamydia in the 10-14 age range. The overall incidence rose slightly during 1998 (Figure 2). Genprobe 2 was introduced to test for chlamydia during 1997, and the predicted 20% increase in the number of cases detected appears to have taken place over the course of 1998. This increase occurred among both males and females. Figures 3 and 4 show age-specific incidence rates from 1994 to 1998 among both sexes.

There was a slight increase in the number of gonorrhea cases in 1998 (Figure 5), up to 611 cases. Again, the increase occurred after the introduction of Genprobe. Age-specific incidence rates among females and males are shown in Figures 6 and 7.

Two cases of infectious syphilis (primary/secondary syphilis only) were reported in 1998 (Figure 8).

Figure 1
Incidence of Chlamydia by Age Group and Gender, 1998

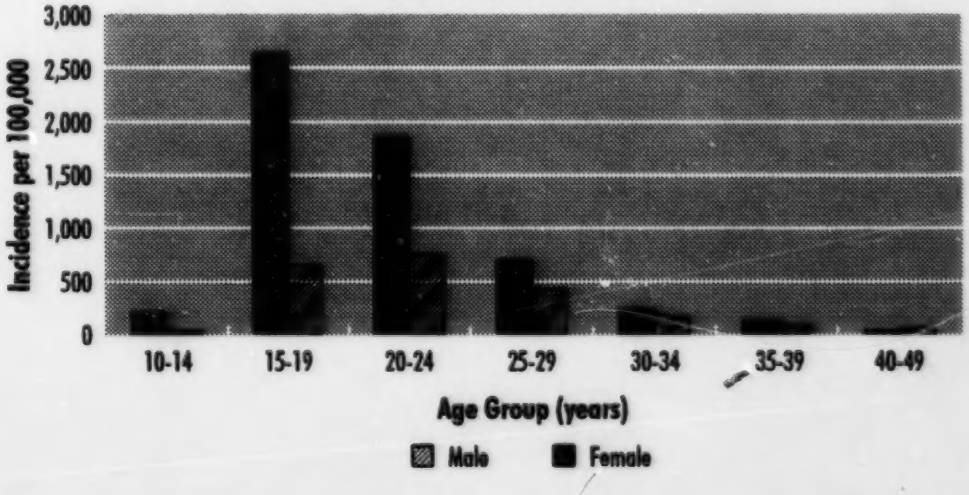


Figure 2
Total Reported Cases and Incidence Rate of Chlamydia, Manitoba, 1988-1998

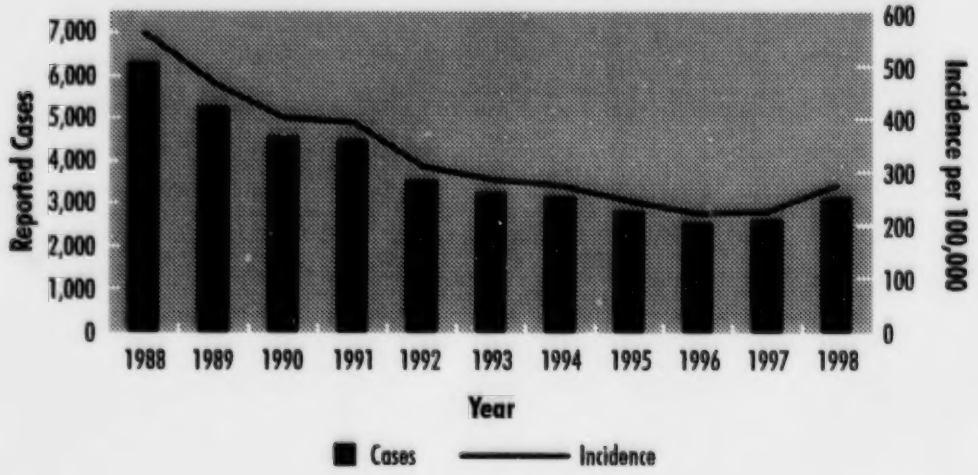


Figure 3
Age-specific Incidence Rate of Chlamydia, Females, 1994-1998

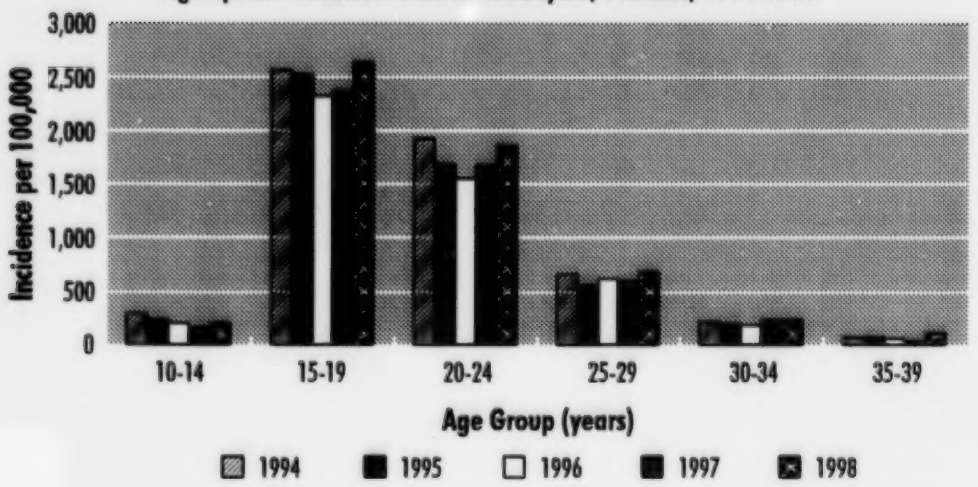


Figure 4
Age-specific Incidence Rate of Chlamydia, Males, 1994-1998

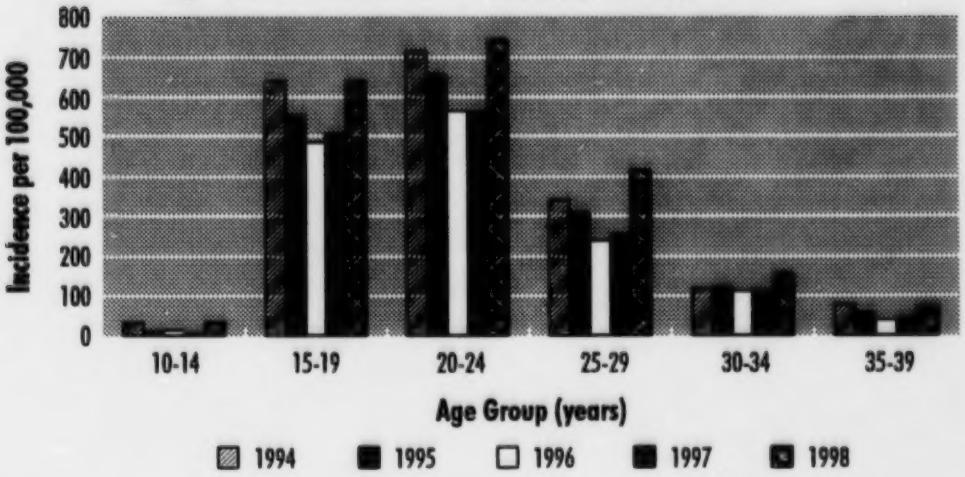


Figure 5
Total Reported Cases and Incidence Rate of Gonorrhea, 1988-1998

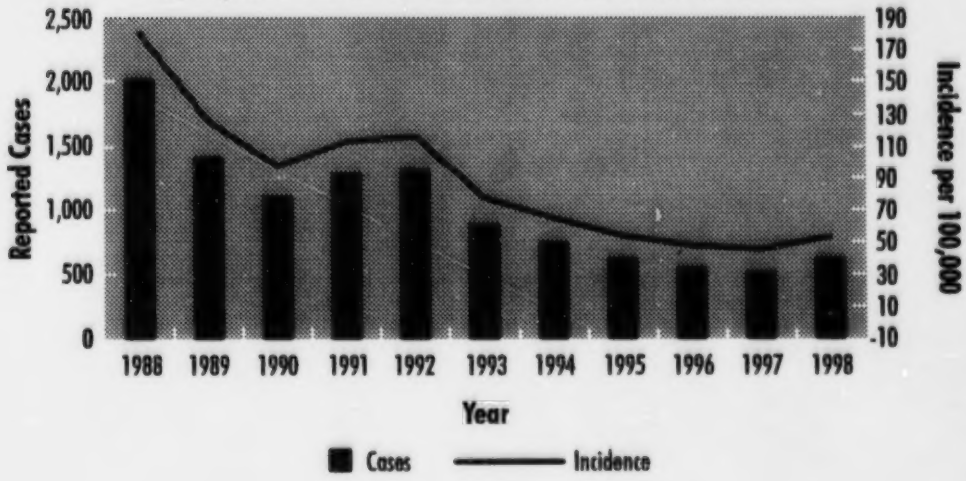


Figure 6
Age-specific Incidence Rate of Gonorrhea, Females, 1994-1998

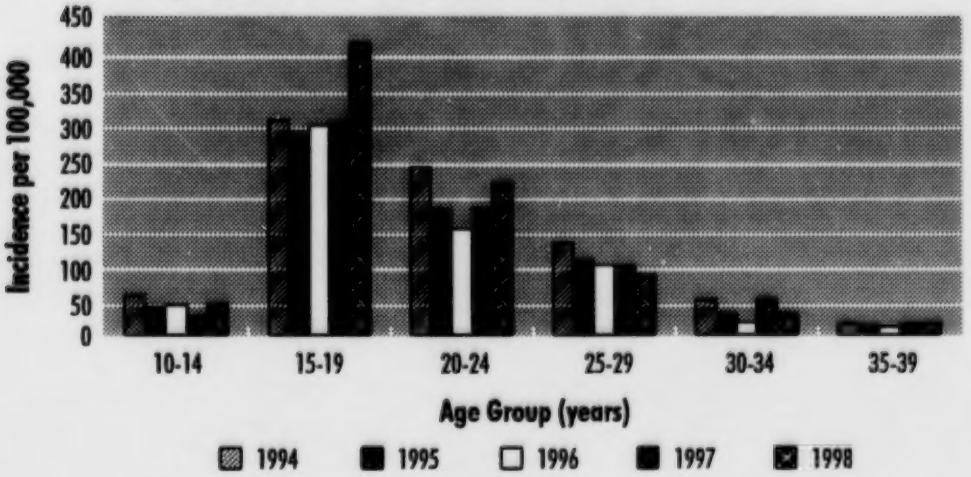


Figure 7
Age-specific Incidence Rate of Gonorrhea, Males, 1994-1998

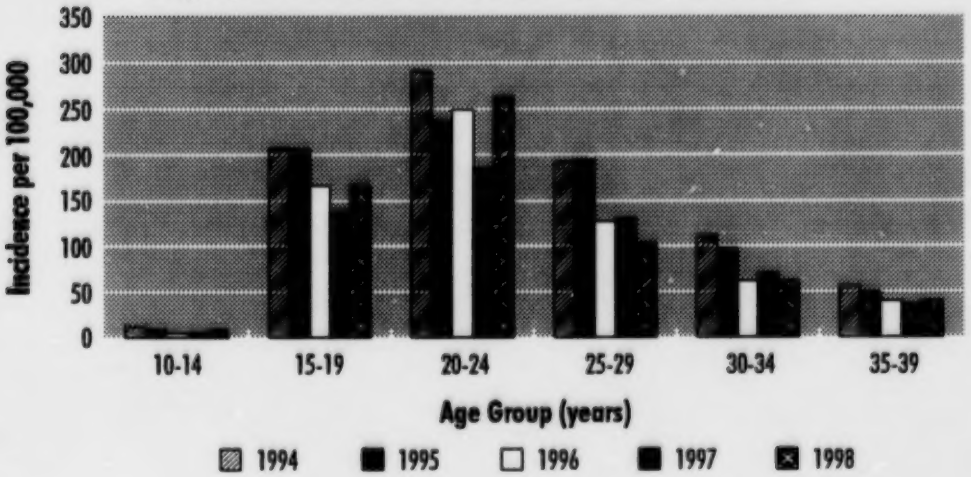
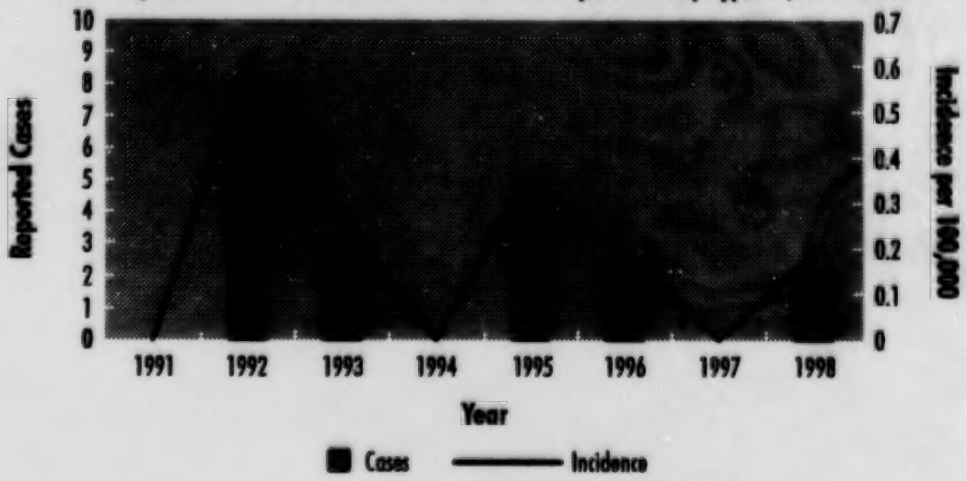


Figure 8
Total Reported Cases and Incidence Rate of Primary/Secondary Syphilis, 1991-1998



Edward Chan

Saskatchewan

In Saskatchewan, EIA capture is used as a screening and confirmation assay for syphilis, rather than VDRL; if results are positive, then VDRL titres are measured. There have been a few outbreaks of syphilis in the last decade, after which the incidence has returned to fairly low levels (Figure 1).

There are about 300 cases of genital herpes per year, of which half are type 1 and half are type 2. Figure 2 shows that the number of cases has been fairly steady over the past nine years, and that it is predominantly women who are affected.

The number of cases of gonorrhea has decreased over the years (Figure 3) and is down to fewer than 400 annually. Comparisons are being made with different testing technologies, and so far it appears that strand displacement amplification will lead to higher rates of detection of gonorrhea, possibly up to double the current rate.

In 1995, PCR techniques were introduced for chlamydia testing of specimens from males, and the resulting increase in detection rates is apparent in Figure 4. The proportion of positive test results in men increased from 12% to 16%.

Figure 5 shows the incidence of hepatitis B, and Figure 6 of HIV, in Saskatchewan. At one time a large proportion of those infected with HIV were homosexual, but recently there have been more intravenous drug users, Native people, and particularly Native women. The number of AIDS cases is presented in Figure 7.

Figure 1
Syphilis Cases in Saskatchewan, 1989-1998

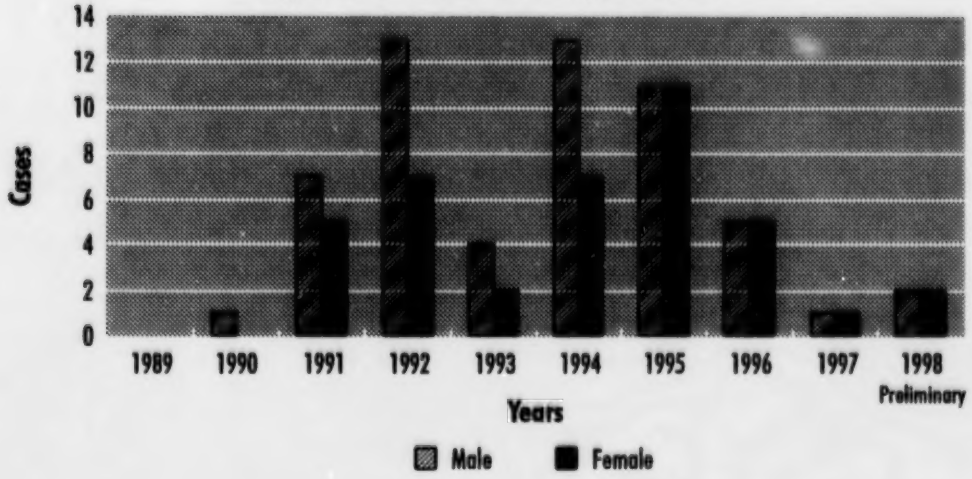


Figure 2
Genital Herpes Cases in Saskatchewan, 1989-1998

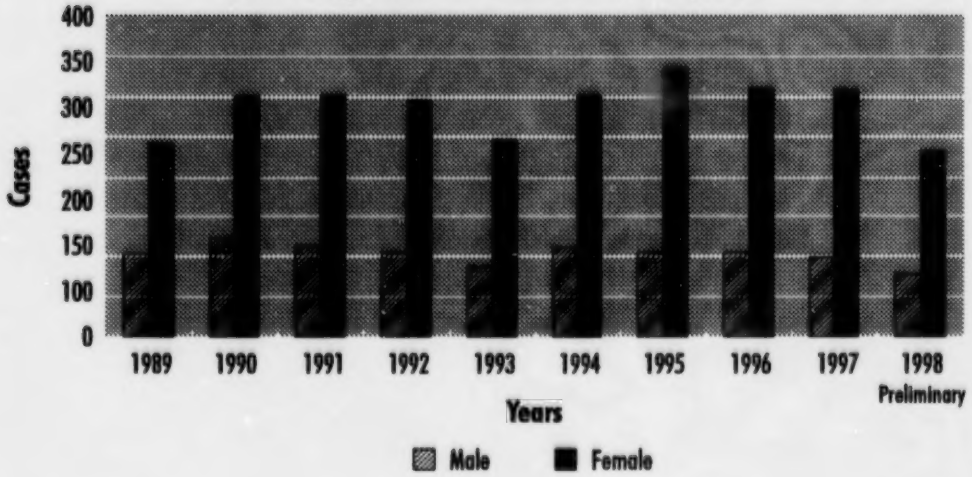


Figure 3
Gonorrhea Cases in Saskatchewan, 1989-1998

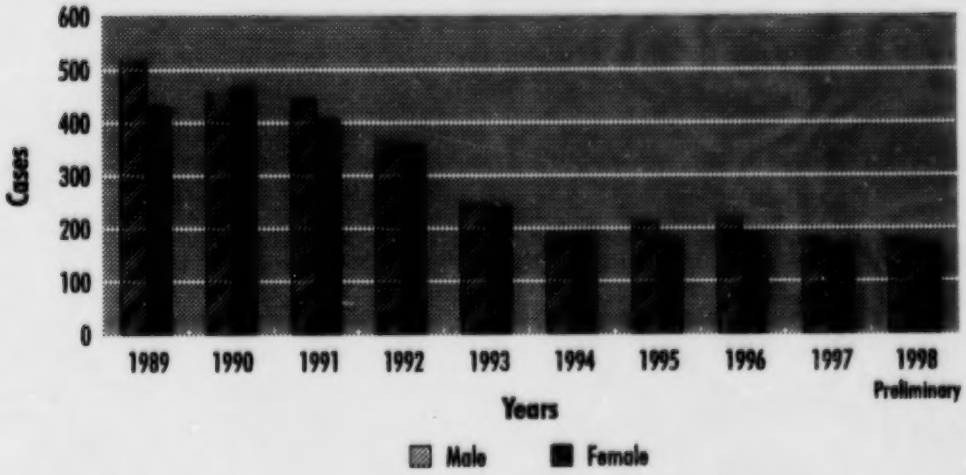


Figure 4
***Chlamydia trachomatis* Cases in Saskatchewan, 1989-1998**

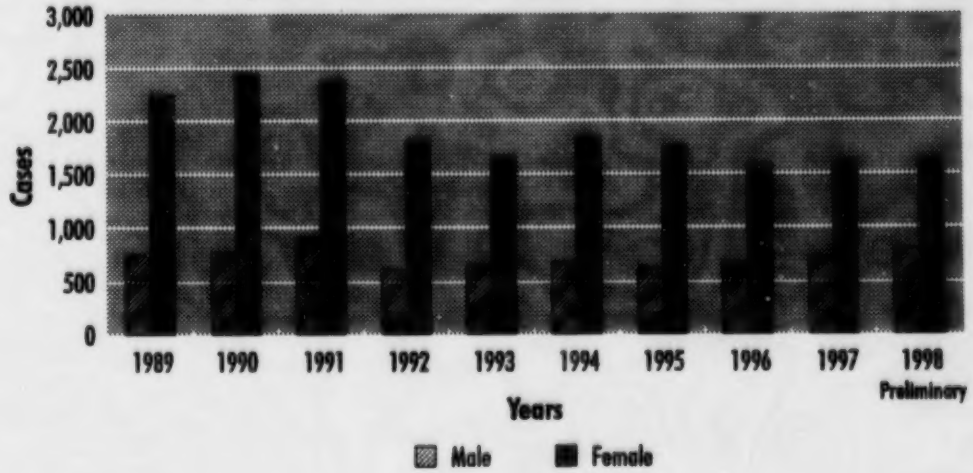


Figure 5
Hepatitis B Cases in Saskatchewan, 1989-1998

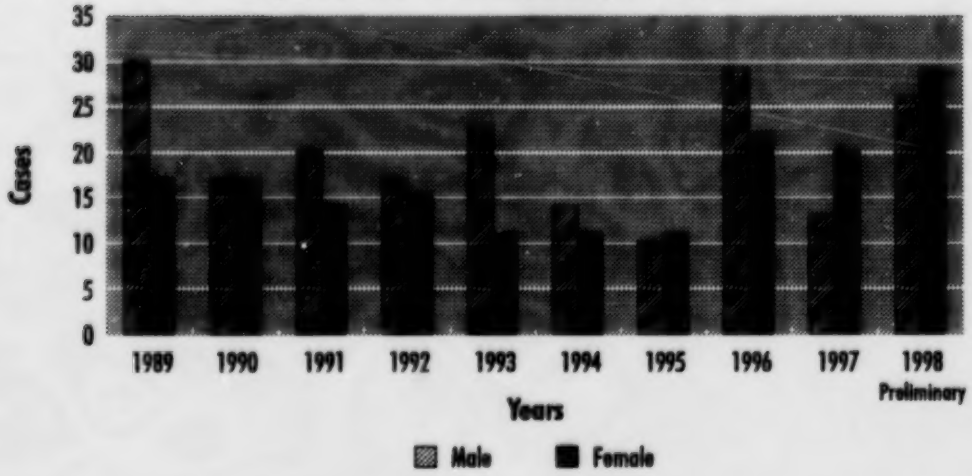


Figure 6
HIV Cases in Saskatchewan, 1989-1998

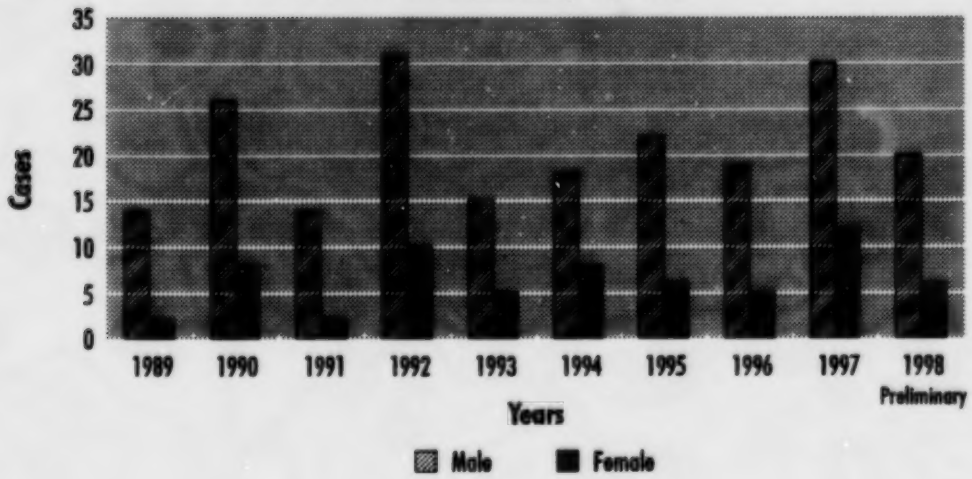
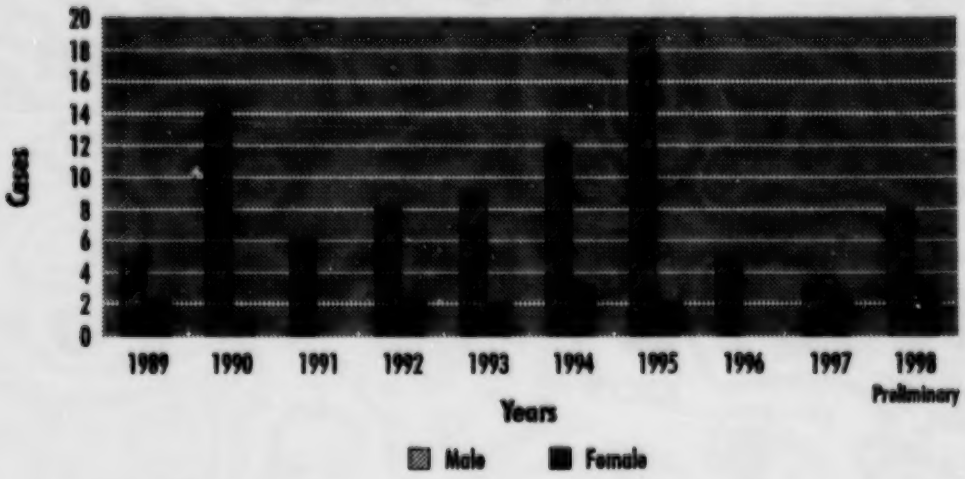


Figure 7
AIDS Cases in Saskatchewan, 1989-1998

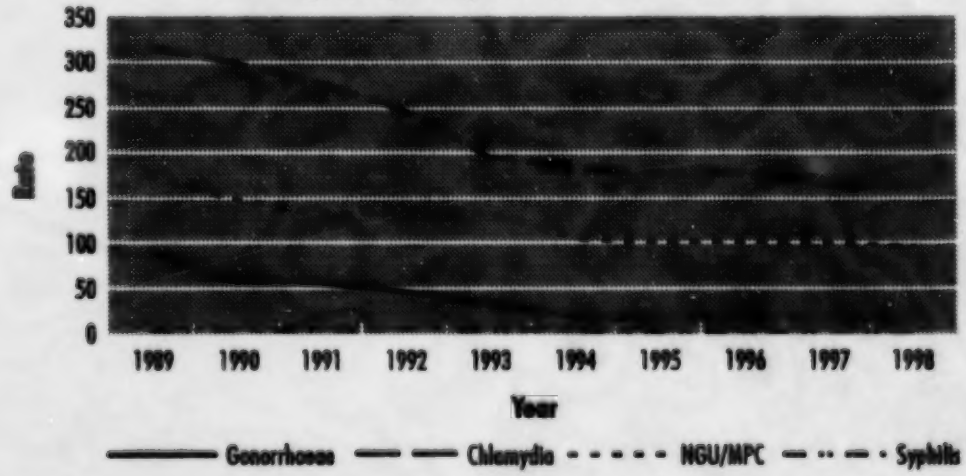


Ameeta Singh

Alberta

As is the case elsewhere in Canada, rates of STDs have decreased over the 1990s (Figure 1). The recent increase in chlamydia incidence, from a rate of 163/100,000 in 1997 to 188/100,000 in 1998, cannot be attributed to changing laboratory technology, since EIA is still the testing method used in provincial and private laboratories in Alberta.

Figure 1
STD Rates per 100,000 Population, Alberta, 1989-1998



The transfer of responsibility for contact tracing from central to regional authorities during those years may have been a factor. The highest rates of chlamydia continue to be found among young females aged 15 to 24. Before moving to DNA-based testing methods, a study will be carried out comparing the cost-effectiveness of EIA and three DNA techniques: PCR, LCR and strand displacement amplification (SDA).

There was an increase in the incidence of gonorrhea from 15/100,000 in 1997 to 19/100,000 in 1998 (about 30%). This may be due, in part, to one private laboratory in northern Alberta, which started to use Genprobe to test for gonorrhea (Table 1). There are some concerns about resistance and the lack of criteria to indicate when culture should be carried out.

Table 1
***Neisseria gonorrhoeae* Cases (Rates), Alberta**

Alberta	
1996	472 (17.2/100,000)
1997	407 (14.6/100,000)
1998	529 (19.0/100,000)
Northern Alberta 1998	
Cultures	161
PCR	147
Southern Alberta 1998	
Cultures	219

Figure 2 gives the number of syphilis cases for 1998. All six infectious cases (primary, secondary and early latent) occurred in men, three of whom were homosexual and five of whom had had contacts in Asia and South America.

There was no significant change in the overall number of HIV infections from 1986 to 1997 (Figure 3). Among females, however, there has been an increase during the 1990s (Figure 4), and the pattern of risk factors has changed: there is now more transmission through injection drug use and heterosexual contact. Prenatal HIV screening was initiated in September 1998; Table 2 presents the data up to December of that year. Since December, two more cases have been identified.

Activities for the future include the following:

- surveillance for resistance patterns in *N. gonorrhoeae*
- cost-effectiveness of different identification methods for *C. trachomatis*
- human papillomavirus genotyping
- epidemiology of STD in pregnancy
- physician compliance with treatment guidelines

Figure 2
Syphilis Cases in Alberta, 1998

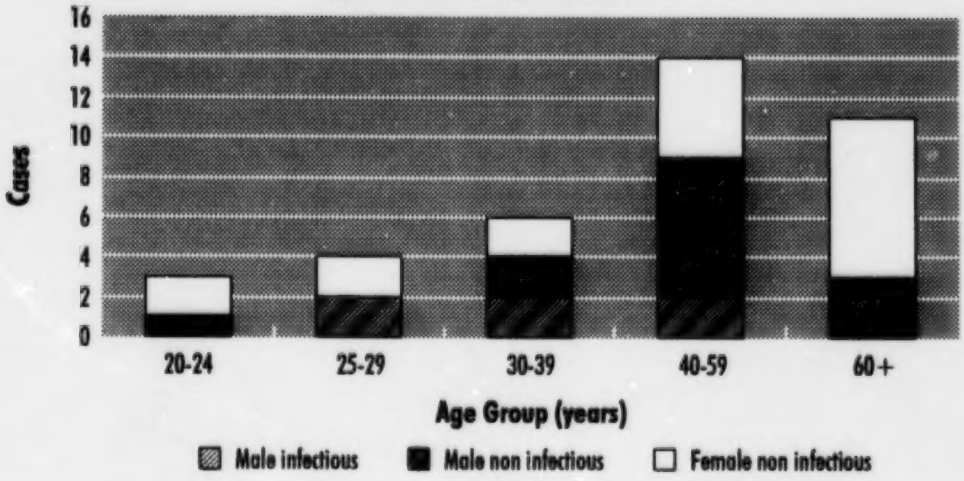


Figure 3
HIV/AIDS Cases in Alberta, 1986-1997

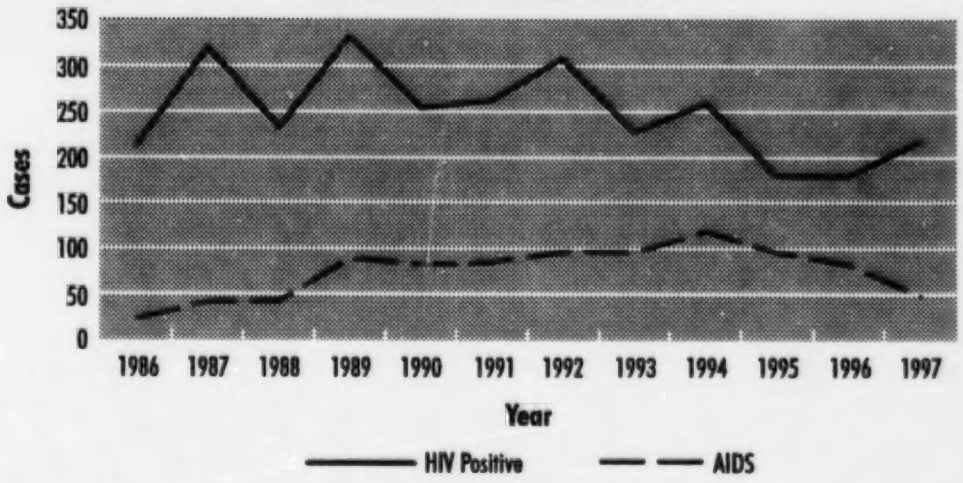


Figure 4
HIV/AIDS in Females, Alberta, 1983-1997

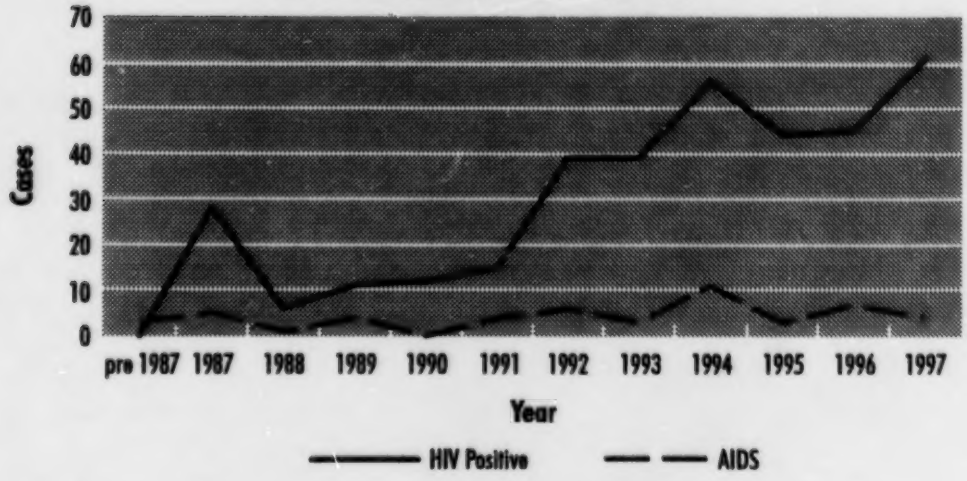


Table 2 Prenatal HIV Screening, Alberta Sept.-Dec. 1998
• Program initiated September 1, 1998
• 19438 (95.3%) tested in 4 months
• 958 (4.7%) declined testing
• 4 women HIV positive
Rate 2.1 per 10,000 tested
(Rate 3.5 per 10,000 1994-95 anonymous unlinked study)

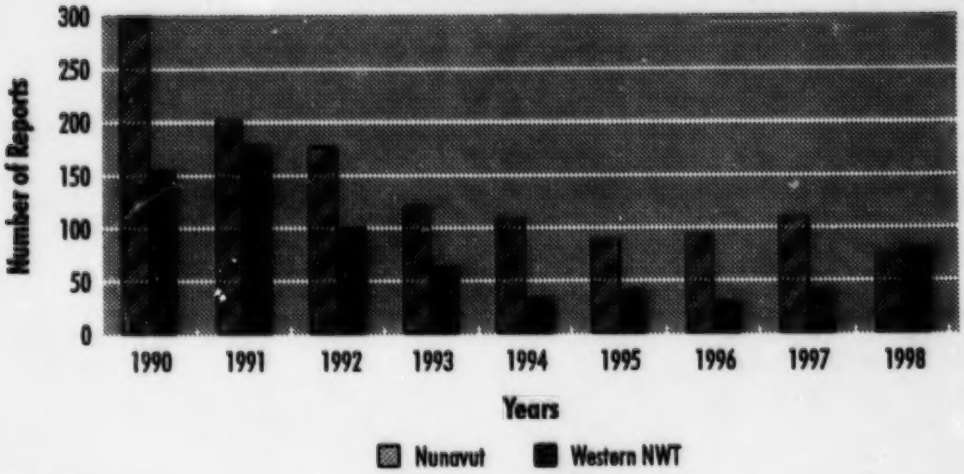
André Corriveau

Northwest Territories

Data from the Northwest Territories are now being broken down by the two main regions: Nunavut and the Western NWT. Figure 1 shows the number of cases of gonorrhea from 1990 to 1998. The decrease in the early part of the 1990s has given way to increases, particularly in the Western NWT (98% increase between 1997 and 1998). In Nunavut, two of the three health regions switched to LCR testing for both chlamydia and gonorrhea at the beginning of 1997. Rates of gonorrhea averaged over five years, by age group, are shown in Figure 2.

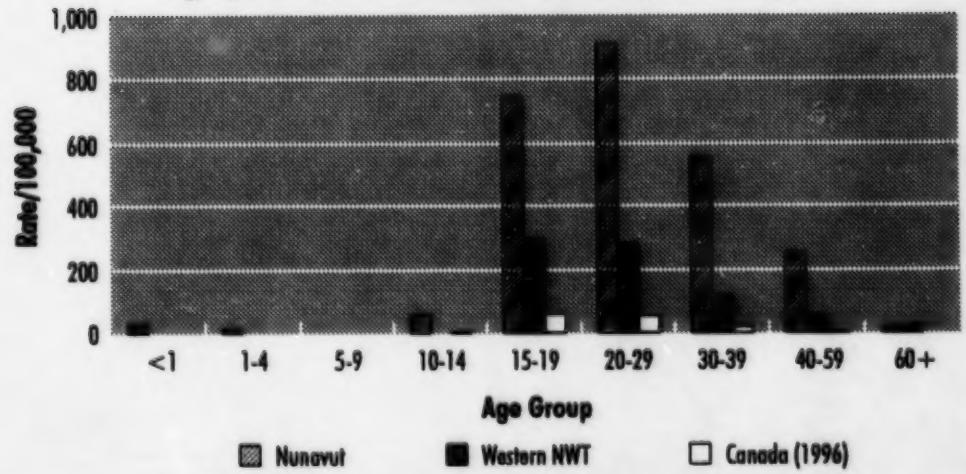
There has been no clear trend in the incidence of chlamydia (Figure 3). Again, there are substantial differences between Nunavut and the Western NWT. There was a 30% increase in Nunavut after the introduction of LCR testing. As well, the introduction of this technology

Figure 1
Gonorrhea Reports, 1990-1998



- Total of 155 reports in 1998
- 32% decrease in Nunavut (74 cases in 1998)
- 98% increase in the Western NWT (81 cases in 1998)

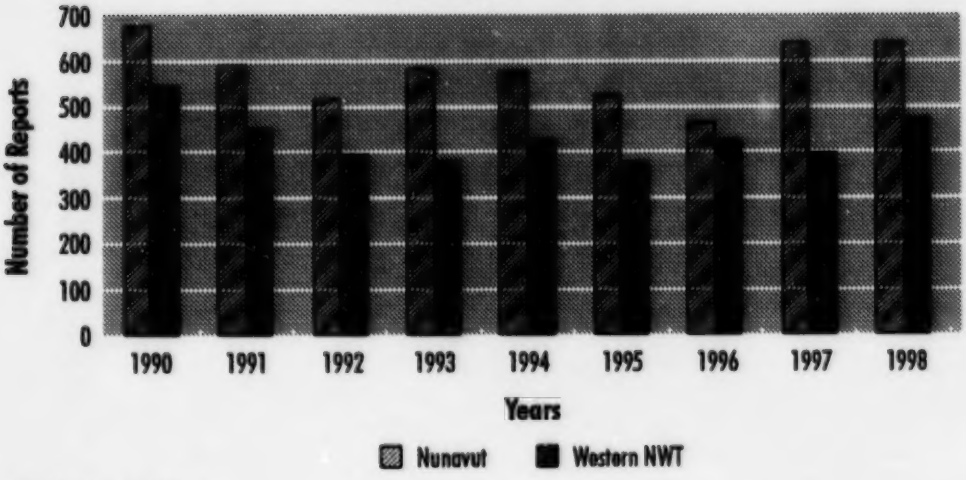
Figure 2
Age-specific Rates of Gonorrhea 5-Year Average (1994-1998)



has led to more males being tested, and a lower ratio (6:4) of female to male incidence. Age-specific rates are given in Figure 4.

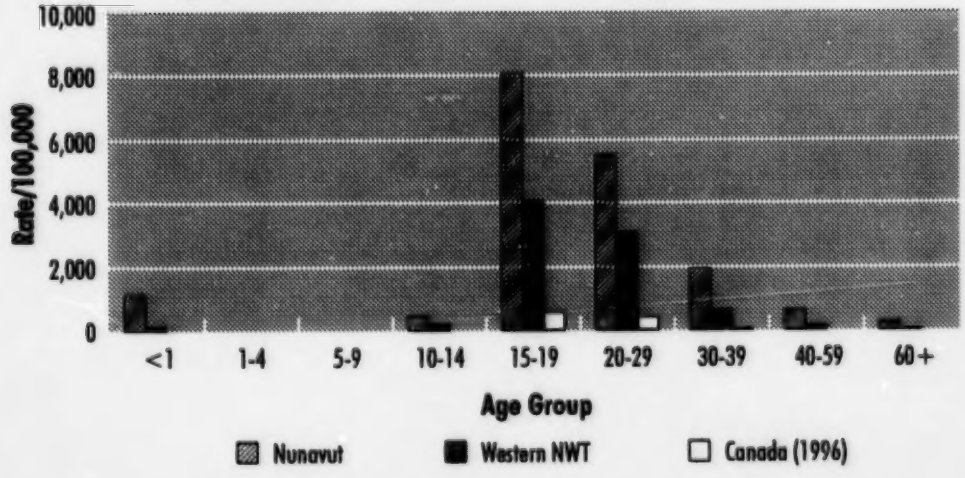
There have been one or two cases of HIV annually since the early 1990s, most of which have involved people returning from other parts of the country; there is no evidence of widespread undetected infection. There have been a large number of hepatitis C infections diagnosed in Yellowknife over the past five years, as screening programs have been

Figure 3
Chlamydia Reports, 1990-1998



- Total of 1121 reports in 1998
- 646 cases in 1998 in Nunavut (previous year was 645)
- 475 cases in 1998 in the Western NWT (18% increase)

Figure 4
Age-specific Rates of Chlamydia 5-Year Average (1994-1998)



intensified. Hepatitis C and HIV testing are offered to prisoners on their arrival at correctional facilities. Rates of tuberculosis remain high, but so far there have been no cases detected of dual infection with HIV and TB.

There have been no cases of syphilis since 1988. Vaccination against hepatitis B is given to newborns and grade 4 children; this year and next year a catch-up program will be carried out in high schools.

David Patrick

British Columbia

The number of HIV cases reported in British Columbia has declined, from a peak in 1996 of 713 to about 540 in 1998, and this has been associated primarily with a large drop in the number of newly HIV-diagnosed IDUs. The downward trend in incidence among men who have sex with men is now flattening off, which is a cause for concern.

The incidence rate for gonorrhea has been decreasing over the last 15 years (Figures 1 and 2), but, as in other provinces, it increased in the last year, from 11.6 to 14/100,000. The increase has taken place primarily in Vancouver. Nucleic acid amplification has not been introduced as a testing method for gonorrhea, and so this is not an explanation for the rise in rates. Among women the increase occurred mainly in the 15-24 year age group and among men in the 25-29 year group.

Rates of chlamydia have decreased during the 1990s, down to a rate of 104.4/100,000 in 1997; in 1998 the rate rose to 119.5/100,000 (Figure 3). PCR was used to test for chlamydia in 1997, and this resulted in 25% more tests being requested and an increase in positive results, particularly among males (30%) (Figure 4). The national goals set for STDs should perhaps allow for up to 20% variability as a result of the new technologies being employed.

The incidence rate of pelvic inflammatory disease (derived from physician diagnosis, surgical out-patient stays and hospital discharge data) has gone down steadily over the last 15 years, to a low of 124/100,000 in 1997, and there have been similar declines in rates of tubal infertility and ectopic pregnancy (Figures 5 and 6).

Figure 1
Gonorrhea in British Columbia by Year

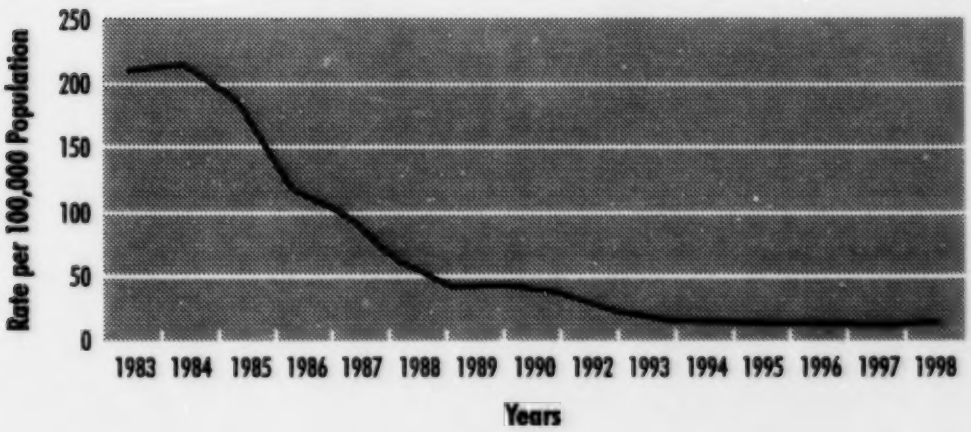


Figure 2
Gonorrhea in British Columbia by Gender and Year

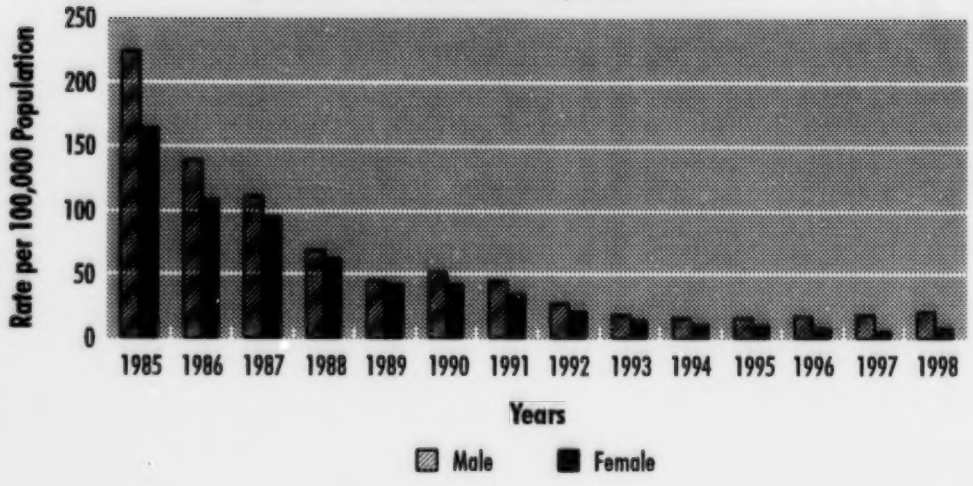
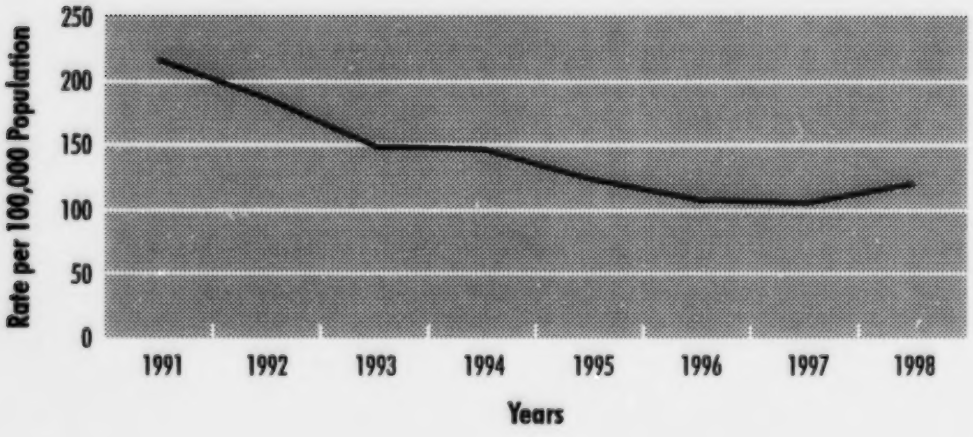


Figure 3
Chlamydia in British Columbia



Infectious syphilis – primary, secondary and early latent – had been on the decline up to 1996 , at levels of about 0.5/100,000 (16-17 cases per year, mainly imported from endemic areas); in 1997, the rate rose to 1.3/100,000 (50 cases), and by the end of 1998 it was 2.9/100,000 (114 cases). Figure 7 shows the number of cases per month over 1997 and 1998 and indicates that the syphilis outbreak began in mid-1997. From July 1997 to the end of December 1998, 152 cases of infectious syphilis were reported: 64 primary cases, 33 secondary, 54 early latent and 1 congenital. The breakdown of syphilis cases by health region is presented in Figure 8. Of the 152 cases, 127 originated

Figure 4
Chlamydia in British Columbia by Gender and Year

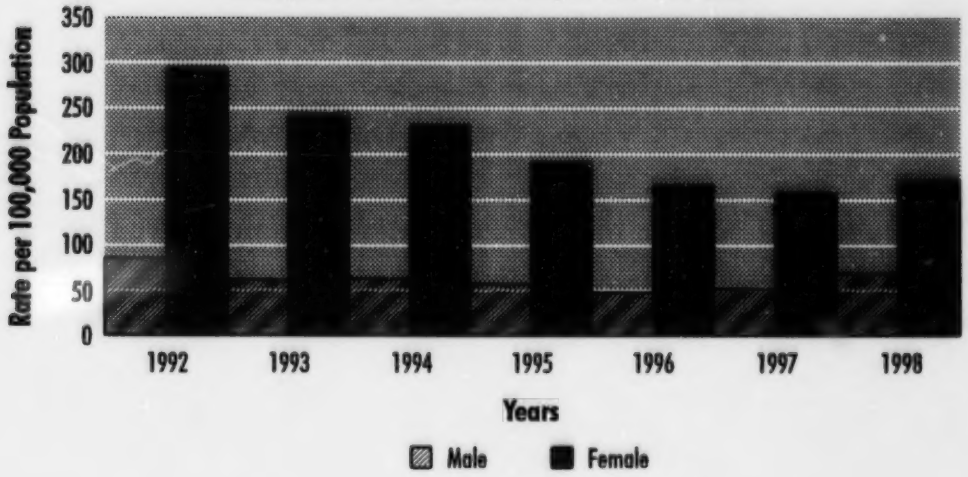
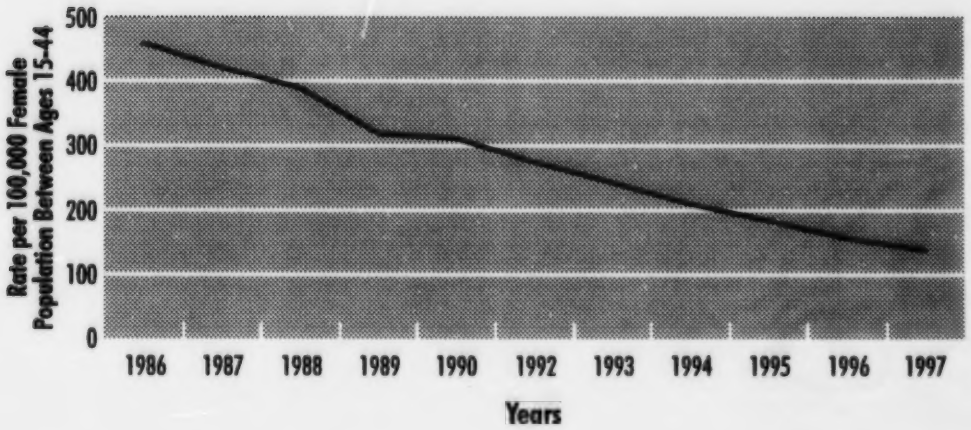


Figure 5
Pelvic Inflammatory Disease in British Columbia



in Vancouver and Richmond, and only 4 from areas outside Vancouver and its adjacent municipalities. Transmission appears to have been related to the sex trade in the downtown east side of Vancouver, an area in which there have also been outbreaks of HIV and hepatitis C and in which public health measures have not been fully effective. Interventions to manage the outbreak include public messages, street level announcements, provider alerts, sex trade worker screening, enhanced linkage with street nurses for partner notification/ screening/treatment, press releases and an article in the *British Columbia Medical Journal*.

Figure 6
Tubal Infertility and Ectopic Pregnancy in British Columbia

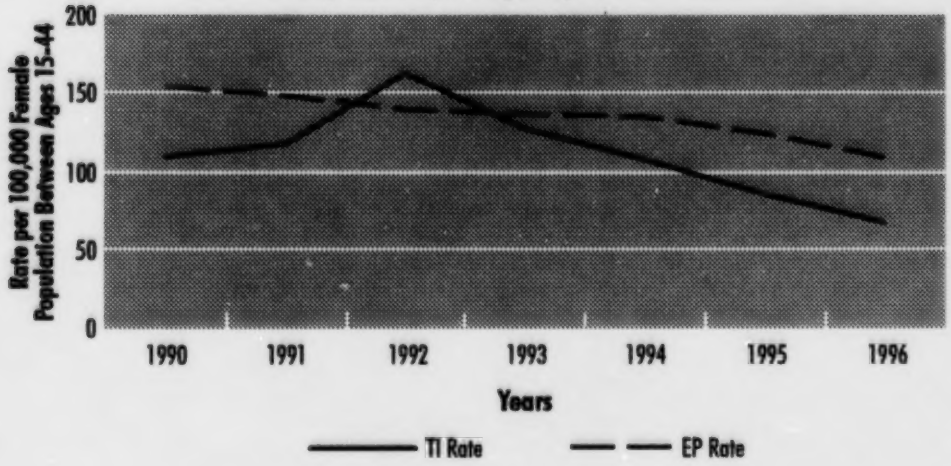


Figure 7
Infectious Syphilis in British Columbia, by Month 1997-1998

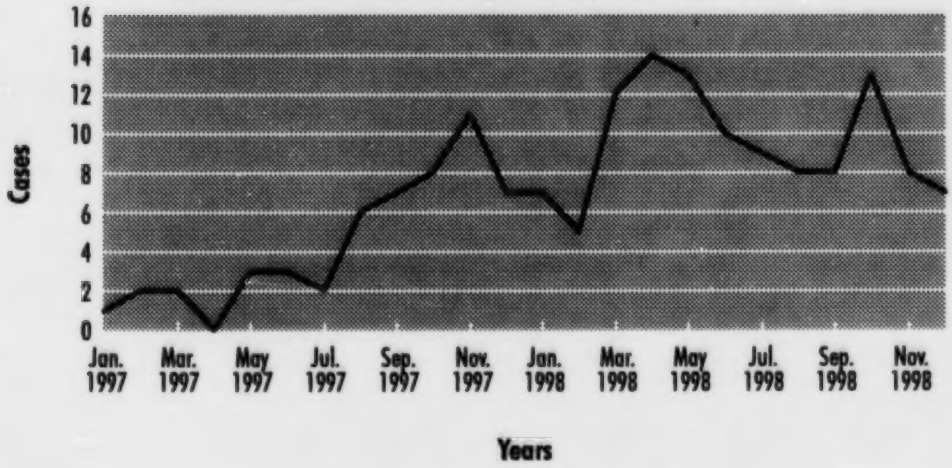


Figure 8
Infectious Syphilis by Health Region, July 1, 1997 to December 31, 1998, n=152

	Infectious S	Other S
Vancouver and Richmond	127	66
Adjacent Munipalities*	21	32
Rest of British Columbia	4	7
B.C.	152	105

* South Fraser, Simon Fraser and North Shore Health Regions

Panel Discussion

The current goal of maintaining national syphilis rates at less than 0.5/100,000 was felt to be open to discussion, given that in some provinces the rates are approaching elimination whereas in other provinces outbreaks are still occurring. Although elimination may be a worthy goal in North America, and in the United States a syphilis elimination program is under way, it will be only a temporary achievement until there are similar changes elsewhere in the world.

The point was made with regard to national goals for STDs that with the switch to NAA technology there will be general increases in positivity rates, which will be an apparent step backward. As well, for the provinces with high rates of STDs, a proportional decrease may be a more appropriate goal than a specific target incidence rate. Dr. Fisher stated that the assumption is being made that the general downward trend in STDs over the last decade is a result of public health intervention, whereas this has not been shown. There is a need to evaluate the various components of public health programs to determine which are effective or ineffective.

With the increasing use of amplification techniques there has been a corresponding reduction in culture of *Neisseria gonorrhoeae* strains. There was concern about the implications for resistance testing, unless a molecular test becomes available that could be used in conjunction with NAA techniques. In the United States, sentinel laboratories have been set up across the country with the mandate of continuing to perform culture for *N. gonorrhoeae*.

It was suggested that the increases in gonorrhea and chlamydia incidence during 1998 in many provinces may not be wholly attributable to changes in testing technology. In Manitoba, for instance, the decline in incidence rates stopped in 1996 and since then the rate has been flat. It is possible that this marks the beginning of a new stage for both gonorrhea and chlamydia, as these diseases become concentrated in core groups and marginalized populations. The traditional public health strategies may need to be replaced with new approaches, perhaps including social network techniques, if incidence is to be reduced further.

With regard to chlamydia, one of these traditional methods has been to test for infection at the same time that screening is carried out with Pap smears. The rate of positivity has been around 2%. However, this does not reach the women at highest risk, i.e. those aged 15 to 24. Screening in schools, although problematic, could be one new testing strategy. Dr. Chan mentioned a pilot study of urine testing for chlamydia carried out in high schools in Saskatchewan. The positivity rate among females was 22% to 25% and among males was 15%, much higher than in the Saskatchewan population. Dr. Embree pointed out that many of the women in their 20s who have an STD also had disease at much earlier ages, so that the large number of infections among females aged 15-24 may in reality represent a smaller group with multiple infections. Resources should be geared primarily towards helping families ensure that their teenagers do not begin the cycle of high-risk behaviour.

It was suggested that even more important than new screening strategies is the approach to working with high-risk communities. One possibility mentioned by Dr. Rothenberg is to "take the lab to the street". Methods for testing in the field are available for all the STDs and could be used to reach more individuals at risk than is possible through clinics. Another point raised was that resources need to be used differently: at present, some jurisdictions have nurses working with high-risk groups out in the community and on the street, but there has been evidence that peer educators and caregivers are more effective in influencing the behaviour of people traditionally difficult to reach. Dr. Patrick felt that in British Columbia, although many peer support workers and outreach staff have been working on the streets, what is needed is more accessible addictions treatment. Policy and the systemic roots of the problem, e.g., lack of housing, education, health services, were areas Dr. Myers believed should be addressed.

Dr. Wong suggested that a sharing of useful strategies among provinces and working together would help achieve overall national goals, and that any reduction in rates can be considered a success. Dr. Matusko stated that this is an ideal time to look for leadership from LCDC in working with provinces and evaluating new intervention strategies for outbreaks of gonorrhea and syphilis.

A review of case definitions and reportable diseases is being undertaken by the Advisory Committee on Epidemiology. It was decided that Dr. Corriveau, as new chair of the ACE Subcommittee on Infectious Diseases, should organize a small working group that would contact the provinces and territories for their input on the review.

New Developments in Laboratory Science and National Goals

Summary

Dr. Lai King Ng stated that the National Laboratory for STDs has been monitoring the resistance of *Neisseria gonorrhoeae* since the 1970s. The number of penicillinase-producing *N. gonorrhoeae* (PPNG) isolates, of which the NR/1B-01 and NR/1B-02 are the most prevalent types, has decreased dramatically. Double resistance to penicillin and tetracycline is a more recent development; the predominant types here are different from those of PPNG or tetracycline-resistant strains. Identifying which strains of gonorrhea are endemic to Canada and which are imported is a necessary component in elimination.

Dr. Jim Mahony described the development of an assay to detect both chlamydia and gonorrhea in self-collected specimens, to be used in the field in developing countries. Nucleic acid sequence-based amplification is the technology used. The presence of inhibitors in the urine samples may have decreased the assay's sensitivity, and a purification step may need to be included. If the assay is shown to have satisfactory sensitivity and specificity in larger studies it could have a role in managing STDs in developing countries.

Dr. Rosanna Peeling discussed the implications for disease control of using nucleic acid amplification testing (NAAT) and described two relevant studies. In the first, carried out in Manitoba, NAAT was found to be substantially more sensitive than enzyme immunoassay in detecting chlamydia. The second study, conducted in Nunavik, Quebec, was related to the effectiveness of NAAT screening in reducing the incidence of chlamydia infection; a significant decrease was found.

Dr. Max Chernesky used a mathematical computer model to calculate the costs associated with NAAT testing and screening. It was found that NAAT diagnostic testing for chlamydia together with annual screening of 15-24 year old women (urine sample) had the greatest impact on chlamydia prevalence; the greatest cost saving was obtained by screening (cervical swab) only 15-24 year old women with two or more sexual partners.

Lai King Ng

Laboratory Diagnosis of GC and GC Resistance in Canada: New Developments

The National Laboratory for STDs has been monitoring the resistance of *Neisseria gonorrhoeae* since the 1970s. It receives isolates from provincial laboratories and uses serotyping and auxotyping to determine which are the strains most likely to have the beta lactamase-producing plasmid; the first was isolated in 1976. The number of such isolates has decreased dramatically, probably because penicillin is not used extensively now to treat gonorrhea. Every variety of penicillinase-producing plasmid (penicillinase-producing *N. gonorrhoeae* [PPNG]) has been sequenced at the national laboratory, and the database is available. The most prevalent are the NR/1B-01 and NR/1B-02 types.

Another group that has important implications for treatment includes the tetracycline-resistant strains (TRNG). Polymerase chain reaction (PCR) is being used to monitor tetracycline resistance and to differentiate between the US and the Netherlands plasmids. Again, the predominant types are the NR/1B-01 and NR/1B-02. Now that the transfer of the laboratory to Winnipeg is complete it is hoped to rebuild the capability to quickly monitor new varieties that emerge and to investigate whether they represent outbreaks.

Double resistance to penicillin and tetracycline (PP/TRNG) has emerged over the last 10 years. The predominant types here are different from those of PPNG or TRNG, and it is not clear whether acquisition of an additional plasmid determinant has changed the characteristics of the phenotype or whether these types are imported from elsewhere.

There was a decrease in the numbers of PPNG detected during 1995-97, which is possibly due to fewer strains being received by the laboratory rather than to greater control over resistance. The data on PP/TRNG in 1996 show that the NR/1A-06 was the most prevalent variety. In Canada the 1B serotype is more common than the 1A serotype. A necessary component of the goal of elimination of endemic gonorrhea by 2010 is to know which strains are endemic in Canada and to characterize them fully, so that imported strains can be quickly identified and investigated.

With the trend towards use of non-cultural methods of detecting chlamydia and, more recently, gonorrhea, the national laboratory is considering what new techniques might be used in the future to identify serotypes of *N. gonorrhoeae* and to monitor resistance.

Jim Mahony

Development of a Self-contained, Nucleic Acid Amplification Test for the Detection of Multiple STDs in Patient-collected Specimens in Developing Countries

Dr. Mahony presented the first year results of a three-year study, funded by WHO and LCDC, to develop an assay that can (a) detect both chlamydia and gonorrhea by means of a self-collected vaginal swab or first-void urine sample and (b) be used in the field in

developing countries. The impetus for such a study is the heightened susceptibility to HIV of people with other STDs.

An amplification test was developed using nucleic acid sequence-based amplification (NASBA) technology, which is similar to PCR and LCR but is homogeneous and isothermal, and so allows processing in ambient high temperatures. Table 1 describe the methods used in the laboratory; in the field, techniques such as line chromatography or latex agglutination will be used to detect the large amount of NASBA product.

Table 1
Methods

1.	**Specimen:** Urethral swabs (US) and first void urine (FVU) specimens from men attending STD clinics and family practice clinics. US were expressed into 0.5 ml PBS and centrifuged at 1,000 x g for 10 min. Aliquots of FVU (1.5 ml) were centrifuged at 14,000 x g for 20 min.
2.	**RNA Extraction:** RNA was extracted from 0.2 ml of US and FVU sediments using either RNeasy™ (QIAGEN) or XTRAX™ DNA extraction kits (GULL Laboratories) according to the manufacturer's instructions.
3.	**NASBA:** Targets for amplification were 16S RNA for both *C. trachomatis* and *N. gonorrhoeae*. Sense (P2) and antisense (P1) oligonucleotide primers were chosen to give products of 250 nt for CT and 280 nt for NG. NASBA reactions (25 µl) contained 8 U AMV RT, 0.2U RNase H, 40 U T7 polymerase, 12.5U RNA GuardTM, 100 µg/ml BSA, 40 mM Tris-HCl, 1 mM dNTPs, 2 mM NTPs, 10 mM DTT, and 2 µl specimens or control RNA. NASBA was performed according to Sooknanan et al (1995) pp 261-287, In: Molecular Methods for Virus Detection, (eds) Wiedbrauk, DL and DH Farkas, Academic Press, San Diego, CA. NASBA products were analysed by Northern blotting using FITC-labeled oligo probes and enhanced chemiluminescence (ECL, Amersham) and by enzyme linked gel assay (ELGA) using 5'-HRP labeled probes and TMB substrate.

Two NASBA assays were used to detect *Chlamydia trachomatis*, one targeting the 16S RNA and one targeting the cryptic plasmid transcript. Figure 1 shows that the 16S assay picked up about 10 bacterial cells and the second about 1,000. The 16S lends itself better as a target for amplification since it is more sensitive.

Unlike PCR, NASBA technology requires only optimization of potassium chloride (KCl). The optimization for *C. trachomatis* was 90 mmol KCl and for *N. gonorrhoeae* was 80 mmol KCl (Figure 2); thus, 80 mmol KCl was selected as the optimal in the multiplex assay. The two primers for chlamydia and gonorrhea are combined for the multiplex assay, and one amplification test can detect both organisms if they are present.

Figure 3 gives the sensitivity and specificity patterns for both pathogens as determined by probes and indicates that the assay is satisfactory on both counts. Its sensitivity with actual samples is shown in Table 2. The reason for the five positive specimens that were missed was the presence of inhibitors in the urine; it may be that a purification step will need to be included before the amplification. Varying the amounts of *N. gonorrhoeae* RNA up to 100 times that of chlamydia made no difference to the assay's ability to detect *C. trachomatis* RNA. The results are summarized as follows:

- A multiplex NASBA test has been developed for the simultaneous detection of chlamydia and gonorrhea in genitourinary specimens; performance was optimal at 80 mmol KCl, 12.5 mmol magnesium chloride ($MgCl_2$) and 0.2 mmol chlamydia and gonorrhea primers.

Figure 1
Dectection of *C. trachomatis* RNA by NASBA

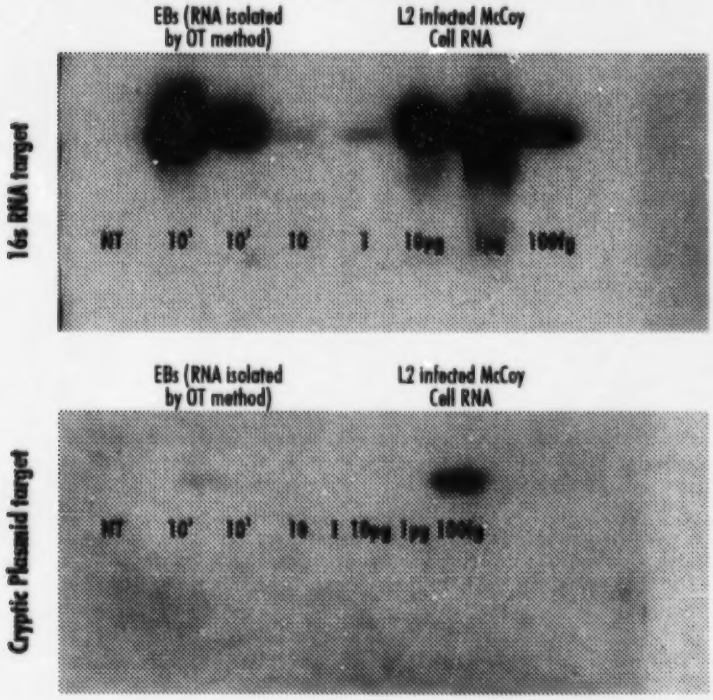


Figure 2
Optimization of KCl concentration

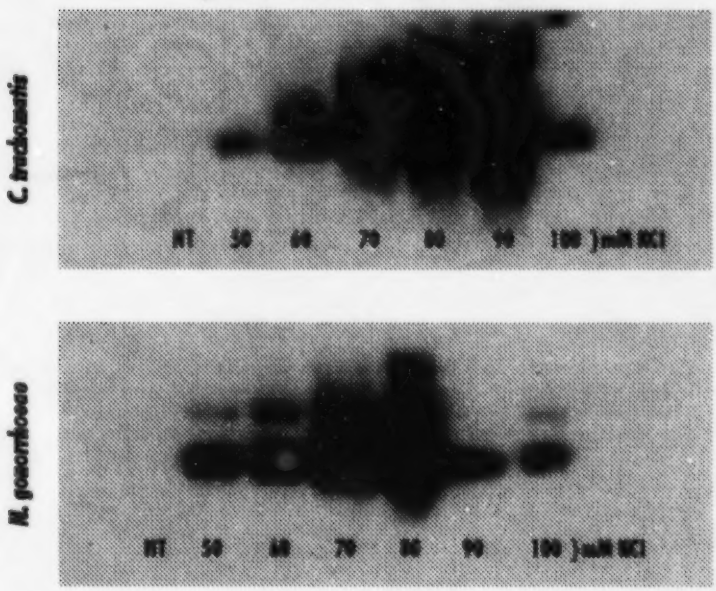


Figure 3
Detection of CT 16S RNA by NASBA/ELGA

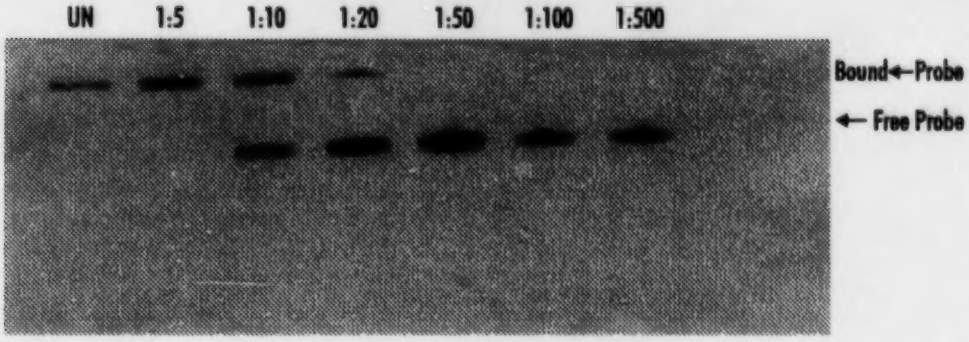


Table 2
Sensitivity of Uniplex and Multiplex NASBA Assays for Detecting *C. trachomatis* and *N. gonorrhoeae*[a]

Assay	No. detected/No. tested	% Sensitivity
CT-NASBA	18/19	94.7
NG-NASBA	35/39	90.0
Multiplex NASBA[b]	53/58	91.4

[a] Based on US or FVU specimens that were positive for NG (N = 36) or both NG and CT (N = 3) by either culture or PCR.
[b] M-NASBA detected 18 CT positives, 35 NG positives including 3 positives for both CT and NG.

- Multiplex NASBA had an analytic sensitivity of 100 fg RNA for both chlamydia and gonorrhea, 1.4 IFU for chlamydia and 1 CFU for gonorrhea.
- Multiplex NASBA detected 35/39 gonorrhea positive specimens, 18/19 chlamydia positive specimens and 3 specimens that were positive for both; sensitivities were 90% and 94.7% for gonorrhea and chlamydia respectively and 91.4% for detecting either chlamydia or gonorrhea.
- The five specimens giving false negative results were retested after *C. trachomatis* and *N. gonorrhoeae* 16S RNA was extracted using capture probes bound to magnetic beads, and all five gave positive results.
- If multiplex NASBA demonstrates high sensitivity and specificity in larger studies and can be manufactured inexpensively, it may have a role for managing STDs in developing countries and reducing the spread of HIV.

Rosanna Peeling

Laboratory Diagnosis of Chlamydia in Canada: New Developments

Dr. Peeling introduced three questions that arise with the advent of nucleic acid amplification testing (NAAT):

- What are the implications for disease control of using NAAT vs. EIA (enzyme immunoassay)?
- Is NAAT screening effective in reducing the incidence of infection?
- How can NAAT be exploited to gain access to high-risk populations?

Two studies were discussed that throw light on the first two questions. The objective of the first study, a collaborative effort involving LCDC, Manitoba Health, Cadham Provincial Laboratory and the City of Winnipeg, was to determine the public health impact of using NAAT as compared with EIA for chlamydia control and prevention. The setting was three community health centres, three walk-in clinics in Winnipeg, and health centres in three rural communities. A urine specimen was obtained from each male who presented at one of these sites for chlamydia testing by EIA (Cadham Laboratory); this was then used to test for chlamydia by PCR at the National Laboratory. An index case was defined as one with a confirmed EIA or PCR positive result. It was hoped to determine from the provincial contact database whether the men positive both by EIA and PCR were more likely to transmit infection than those positive only by PCR.

Table 1 shows the results from the two testing technologies. PCR was found to be substantially more sensitive, detecting 42 positive specimens not found by EIA. The characteristics of the men with positive results by both methods were compared with those of the men who tested positive only by PCR (Table 2). It was found that the men in the latter group were significantly older, with a mean age of 28 years as compared with 22 in the group with two positive test results. From the number of partners upstream and downstream, a surrogate measure of transmission, it appears that men with positive test results only by PCR were less likely to have a sexual partner who tested positive for chlamydia at a later time, but the results are preliminary and have not been fully clarified as yet. See Table 3 for a summary of the conclusions.

Table 1
Manitoba Chlamydia Study: Preliminary Results

		PCR +	PCR −	
EIA	+	23	0	
	−	42	320	
		65	320	= 385

Table 2 Manitoba Chlamydia Study: Preliminary Results			
	EIA +/PCR +	PCR +	p
mean age	22.3 ± 5.9	28.2 ± 8.2	.0037
range	17-40	15-52	
median age	20	27	
# w/symptoms	11/23 (48%)	11/42 (26%)	.103
rural/urban	6/17 (35%)	9/33 (33%)	.731
Partners:			
upstream	6	15	
downstream	7	6	.049

Table 3 Manitoba Chlamydia Study: Summary
• PCR is more sensitive than EIA for the detection of genital chlamydial infection in men → If EIA were used for testing/screening, 42/66 (64%) cases would have been missed.
• The mean age of men who were EIA+/PCR+ was 22 compared to 28 for men who were PCR+ only. → If age <25 were the criteria for screening, 48% of cases would have been missed.
• Men who were PCR+ only appeared to be less likely to have a sexual partner testing + at a later date. → men who were PCR+ only were less likely to transmit disease to their sexual partners.

To answer the second question, a study on chlamydia NAAT screening was carried out in Nunavik, Quebec, an area with a chlamydia incidence rate (ascertained by EIA) among men during 1990-93 of 3,600 per 100,000 as compared with the Quebec average of 203 per 100,000; among women aged 15-19 years the rates were 21,842 vs. 1,307 per 100,000 respectively.

Communities were matched for population size and were randomly paired, one of the pair undergoing an educational campaign and mass PCR screening for chlamydia and the other no intervention. PCR testing was available to all communities. EIA and PCR testing was offered to women seeking prenatal care and those giving Pap smears, as a basis for comparison of incidence rates before and after the intervention. Outcome measures are shown in Table 4.

Participation rates within the communities ranged from 22% to 88%. The preliminary results showed a significant decrease in MADO (maladies à déclaration obligatoire) declarations of chlamydia in the communities that had undergone screening (Table 5). The ratio of female to male chlamydia incidence decreased from 4.0 before to 2.6 after screening. The EIA results are not yet available.

With regard to the third question, data from provincial laboratories show that the women at highest risk of chlamydia infection (ages 15-24) are the ones with the lower rates of testing. How the new amplification techniques can be used to address this problem is open for discussion during the panel session.

Table 4 Nunavik Study
Study Design **Outcome Measures:** – Surrogate markers for effect of education • condom distribution • # men tested • new cases bacterial STD – Intervention • MADO declarations for Ct • Indicator population (EIA+ pre- and post- Ct screening)

Table 5 Nunavik Study: Preliminary Results Community-wide screening campaign: March-April 1997		
	MADO declarations (rate/1000)	
	communities w/o screening	communities with screening
Before screening: (Mar '96-97)	28.1	37.3
After screening: (July '97-98)	26.1	24.2
OR (95% CI)	0.93 (0.7-1.23)	0.65 (0.52-0.81)
p	.61	.0003
Beslow & Day Test for homogeneity of OR: p = .05		

Dr. Max Chernesky

A Mathematical Model of the Cost-effectiveness of Screening and Diagnostic Testing for Chlamydia

The objectives of this study were to use a mathematical computer model to determine the effects on the prevalence of *Chlamydia trachomatis* and the costs associated with that infection of (a) switching to amplification technology (LCR) for diagnostic testing of C. *trachomatis* and (b) screening young, sexually active women annually by means of cervical swab or first-void urine sample.

The model followed the interaction of infected and uninfected males with infected and uninfected females in groups of high and low sexual activity. A decision tree analysis made use of probabilities to calculate outcomes and costs. The model was adjusted to take account of Canadian data and probabilities; the data sources and assumptions are shown in Table 1. Table 2 presents some of the probabilities assumed to be associated with treatment and partner notification.Table 3 gives some of the costs associated with disease among women and shows that treatment of the sequelae of infection carry the highest costs.

Table 1
Data Sources and Assumptions

- Demographics from Canadian 1996 census
- Behavior inferred from "Sex in America Study" (Laumann 1994) and a Canadian Panel of Behaviorists
- Outcome and patient management probabilities from literature and Canadian expert panel
- Chlamydia prevalence and incidence from CDC, LCDC and provincial statistics (1995-97)

Table 2
Selected Treatment and Notification Probabilities

	Gender	
	Female	Male
Of seeking treatment with symptomatic lower tract infection	0.95	0.95
Of seeking treatment with symptomatic upper tract infection	0.95	0.95
Of the partner being notified	0.70	0.70
Of lower tract treatment success using:		
-azithromycin	0.95	0.95
-doxycycline	0.95	0.95
Of outpatient PID treatment success using:		
-Rx guidelines	0.95	0.95

Table 3
Disease State Costs in Ontario 1997

Women	$ Cdn
Cervicitis (doxycycline)	34.38
Cervicitis (azithromycin)	53.00
Outpatient PID	229.07
Inpatient PID	1,942.48
Ectopic pregnancy	2,163.74
Chronic pelvic pain	325.37
Tubal infertility	12,169.93

The sensitivity, specificity and costs of the diagnostic testing methods were estimated from published figures and gold standards (Table 4).

Five different scenarios were tested:

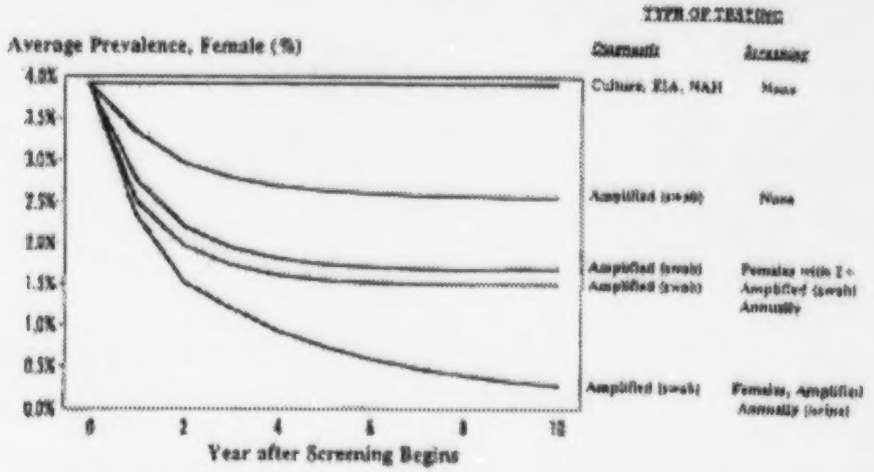
- Status quo testing (no screening) using existing technology
- No screening, but NAA (LCR) used for diagnostic testing
- Screening of 15-24 year old females yearly by means of a cervical swab
- Screening 15-24 year old females yearly by means of first-void urine sample

Table 4
Sensitivity, Specificity and Costs for the Diagnosis of *Chlamydia trachomatis* in Ontario, 1997

Method	Specimens	% Sens.	% Spec.	Testing Cost[1]	Total Billable Cost[2]
Culture	swab	70	100	15	40
EIA confirmed	swab	70	100	8	40
NAH confirmed	swab	70	100	8	40
NAA	swab	95	100	15	40
	urine	85	100	15	40

[1] Includes cost of reagents and performance of test (billable amount is $16.00 in each case)
[2] Includes pelvic exam and swab collection or intermediate assessment and urine sample

Figure 1
Impact of Diagnostic Testing or Screening on Prevalence

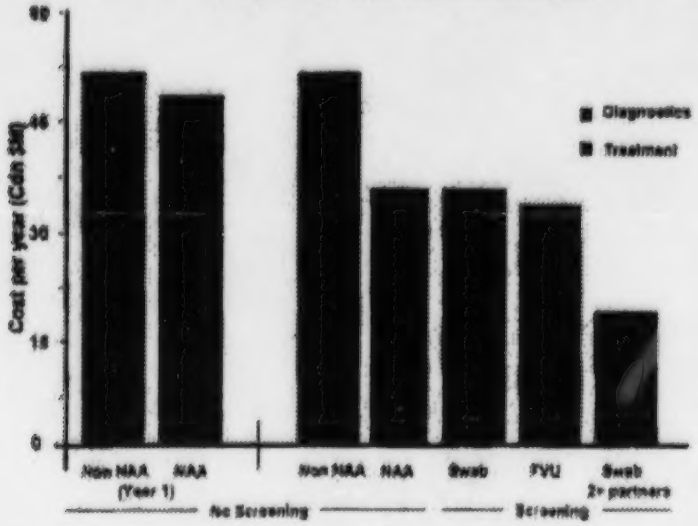


- Screening 15-24 year old females (2+ sexual partners in previous year) by means of cervical swab

Figure 1 shows that the fourth of the testing/screening scenarios had the greatest impact on prevalence: diagnostic testing supplemented with screening of 15-24 year old females yearly by means of a urine sample reduced the prevalence from 4.0% to 0.5% (representing a reduction of over 80%) after six years. If screening is stopped, the curves return to their original level.

With regard to costs, remaining with the status quo in diagnostic testing costs about $49 million per year, $6 million of which is for testing and the remainder for treatment of chlamydia (Figure 2). Changing to NAA testing during the first year results in an immediate $3 million saving in treatment costs, which has increased by year 10 to a saving of about $15 million per year. With the addition of screening, the total costs are the same as the no-screening scenario for 15-24 year old women screened with a swab, although the

Figure 2
Annual Diagnostic and Screening Costs for Testing and Treating *Chlamydia trachomatis* Infection in 15-24 yr. old Women after Ten Years in Ontario using Nucleic Acid Amplification (NAA)



majority of the cost lies in the diagnostic procedures rather than in treatment. If the screening is carried out using urine samples the costs are down slightly by an additional 5%. The greatest saving (60% per year) is in screening (swab) only the women in this age group with two or more sexual partners.

It is hoped to use the model to apply this analysis to other provinces and possibly to investigate the impact of chlamydia screening on infection in men and its sequelae in women.

Panel Discussion

Dr. Lai King Ng began the discussion by pointing out the current importance of surveillance of antimicrobial resistance and the impact that the new amplification technology will have on this. She asked for discussion of whether we benefit from the new technology, and how we should proceed with its use.

At present it is not in the interests of private laboratories to adopt the newer technology, since these tests cost more than the traditional ones to perform and the laboratories make hardly any profit. Dr. Patrick felt that governments should negotiate a funding formula for private laboratories that would be an incentive for them to perform NAAT.

Dr. Embree wondered whether the results of the Manitoba study on chlamydia, in which men with positive test results from PCR testing only were less likely to infect sexual partners, raised the question of why we should change to the newer techniques if EIA testing is adequate

from a public health point of view. Dr. Peeling stated that the results described are preliminary. Moreover, it is hoped to carry out quantitative PCR testing to determine the bacterial load in the specimens and investigate whether a quantitative difference would explain the study results.

With regard to the testing method being developed by Dr. Mahony and the assumption that detecting and treating STDs will lead to a reduction in HIV infection, Dr. Fisher pointed out the possibility that having an STD is a marker for practising unsafe sex, and that treatment of the disease will not affect biological vulnerability to HIV. He felt that along with development of more advanced testing techniques there should be interventions to modify high-risk behaviour. Dr. Peeling agreed, and described the concern there had been in the Nunavik study that participants not be given the impression that the screening was a "quick fix" for bacterial STDs.

Dr. Jolly was concerned that the data from several provincial laboratories show women over age 30 to be the most frequently tested group, whereas this is a group at relatively low risk for chlamydia. Education of physicians was mentioned as one possibility for reaching the age groups at highest risk. Dr. Chan mentioned that high school testing of urine samples for chlamydia had generated a lot of data in Saskatchewan; he also stated that culture of *N. gonorrhoeae* can be done from the same urine sample that is tested by amplification techniques. This is probably the best approach to susceptibility testing until genetic methods are available.

Viral STDs and National Goals

Summary

Dr. Alice Lytwyn described a study to determine the prevalence of human papillomavirus (HPV) among women across Ontario. Overall prevalence of oncogenic types using Digene testing was 12.5%, and the highest rate was in the 20-24 year age group. Of 556 samples, 60 were positive for HPV 16, and 18 positive for HPV 18, the most important types in the genesis of cervical cancer. All the women with high grade lesions on the Pap reports were positive for oncogenic HPV. Possible risk factors for HPV included early age at first intercourse and > 5 lifetime sexual partners.

Dr. Marc Steben indicated that Canadian data on genital herpes are lacking, but a study in Vancouver found that among pregnant women with one partner the seropositivity rate was 2%, and among those with > 10 lifetime partners the rate was 55%. Two new tests based on the glycoprotein of herpes simplex virus may soon be available in the United States; they will be cheaper than Western blot but not as precise. There is a clear need for guidelines to be developed on testing and counselling.

Dr. Rosanna Peeling reported that there are few Canadian data on HPV, and yet it may be that a rapid increase in rates has been taking place. She mentioned some possible sources of information on HPV, such as serum surveys and cohort studies.

Alice Lytwyn

HPV in Ontario Women Aged 15-50 years

This study, funded by LCDC, involved 999 randomly selected women aged 15-49 years who visited their family practitioner for a Pap smear or with a routine vaginal complaint. The objectives of the study were to determine the age-specific prevalence of (a) oncogenic and non-oncogenic types of human papillomavirus (HPV) and (b) the prevalence of cytologic abnormalities as determined by a Pap smear.

Women were recruited from practices across Ontario. They were asked to complete a questionnaire on demographic information and risk factors, and to provide two cervical brush samples for HPV testing, one for PCR and one for a hybrid capture test, as well as a Pap smear.

The proportion of women recruited from each region matched as closely as possible the population of that region as a proportion of the whole Ontario population (Table 1). Preliminary results are available for 556 women. The number in each age group is shown in Figure 1. Fewer women in the 15-19 year category visited their family doctor for a Pap smear, possibly because they attend sexual health or university-based clinics instead.

The survey results showed that 88.2% of women were born in Canada; 64% were married, 28% single and 8% separated, divorced or widowed. With regard to education, 71% had completed postsecondary education, and only 1.8% had not achieved grade 10; 67% were in paid work. About 30% were smokers. Table 2 presents information on sexual behaviour and reproductive health.

The overall prevalence of HPV using Digene testing (an RNA/DNA hybridization technique) was 12.5%, and the highest positivity rate was in the 20-24 year age group (Figure 2). The prevalence according to PCR testing, which is believed to be a more sensitive method, was very similar, at 12.4% (Figure 3). The positivity rate among 15-19 year olds was higher with this type of testing, and apart from an unexplained peak in the 45-49 year group the rate fell with increasing age. Typing of HPV by PCR or hybridization resulted in eight samples that

Table 1
Survey Of HPV in Ontario Women: Regional Distribution

Region	Sample (n)	Percentage of total sample	Percentage of population	Regional population (n)
Central East	179	32	45	5,056,973
Central West	131	24	19	2,123,179
Eastern	11	2	14	1,531,274
Northeast	78	14	6	668,277
Northwest	24	4	2	256,718
Southwest	133	24	14	1,497,693
Total	556	100	100	11,134,114

Figure 1
Frequencies

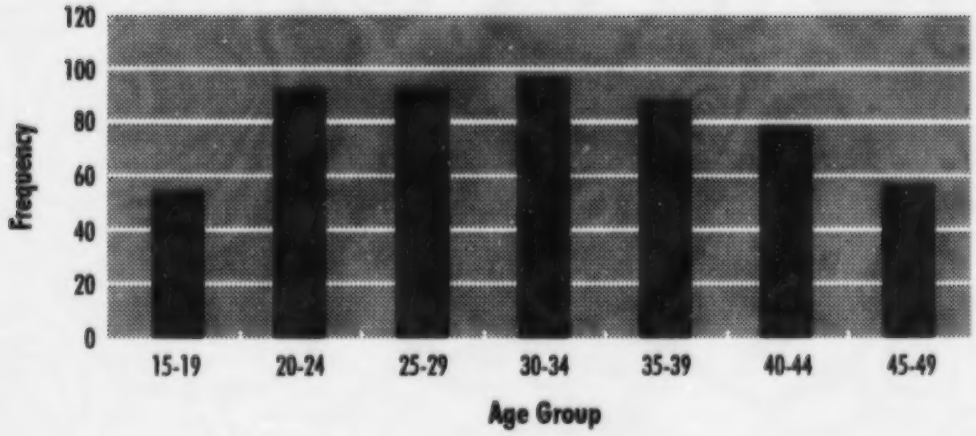
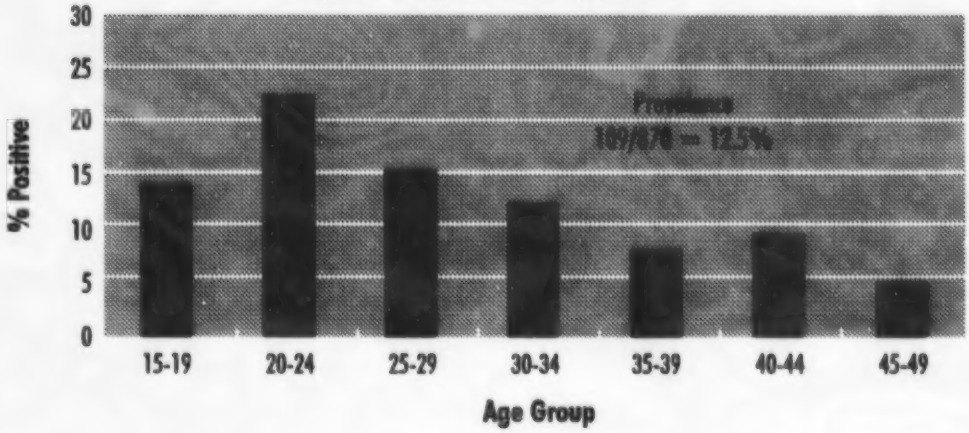


Table 2 **Survey of HPV in Ontario Women: Sexual Behaviour and Reproductive Health**	
Mean age at first intercourse	17.5 years
Mean number of partners in previous year	1.1
Mean number of partners in lifetime	6.9
Taken birth control pills ever	90.1%
Birth control	
• birth control pills	41.5%
• condom	27.9%
• sterilized	11.0%
• vasectomy	10.3%
• rhythm/withdrawal	3.4%
• implants/Depo-provera	1.4%
• condom and foam	1.1%
• IUD (intra-uterine device)	0.5%
• diaphragm-foam/spermicide	0.4%
• foam	0.4%
• sponge	0.2%
• other	0.2%
Condom use	
• always	12.9%
• inconsistent	35.4%

Hormone replacement therapy	1.3%
Currently pregnant	5.4%
Mean number of live births	1.8%
Any STD in the past?	
• genital warts	8.6%
• chlamydia	7.8%
• gonorrhea	1.9%
• genital herpes	1.7%
• trichomoniasis	1.7%
• syphilis	0.7%
Referred for colposcopy	12.9%
Treated for cervical lesions	20.3%

Figure 2
Digene Testing of Cervical Specimens



were positive for HPV 6 (non-oncogenic), 60 positive for HPV 16, and 18 positive for HPV 18 (the most important types in the genesis of cervical cancer).

Table 3 shows the results of the Pap reports. The samples of 33% of women with ASCUS and 87% with LSIL (low grade lesions), and 100% of those with HSIL (high grade lesions) were positive for oncogenic HPV. Possible risk factors for HPV included early age at first intercourse (≤ 19 years), number of lifetime partners (> 5), not being in a stable relationship and current smoking.

Few studies are available for comparison with these preliminary results, but a 1997 report on a population-based study in Costa Rica (Herrero R et al: Rev Panam Salud Publica/Pan Am/Public Health 1997;1(5):362-375) gave a similar HPV pattern of prevalence with age.

Figure 3
PCR Testing of Cervical Specimens

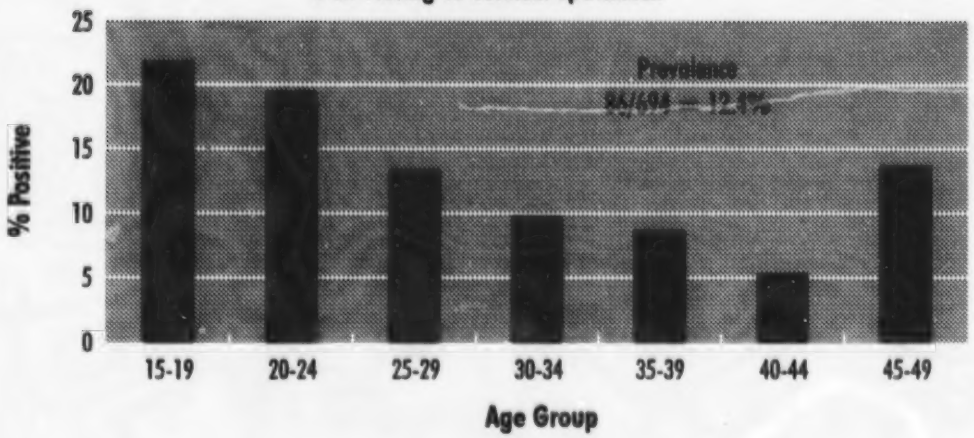


Table 3 Survey of HPV in Ontario Women: PAP Reports	
Pap report	**% of total sample**
Normal	81.5
Benign cellular changes	12
ASCUS	2.7
LSIL	2.7
HSIL	0.5
Unsatisfactory	0.2
Pap report	**% Digene positive**
Normal	12
Benign cellular changes	12.1
ASCUS	33.3
LSIL	86.7
HSIL	100
AGUS	0
Unsatisfactory	0

Marc Steben

Newer Developments in HSV

Genital herpes remains an STD on which there are very few data in Canada. The results of a major US study, the National Health and Nutrition Study III, were published last year: 12,000 people aged 12 and over were tested for herpes simplex virus (HSV). There was a disturbing increase in the seroprevalence rate among teenagers, at five times higher than the figure from the previous study; the rate among people in their 20s was twice as high as before. Only 9% of seropositive participants questioned knew that they were infected. Overall, 15% of males as compared with 20% of females were seropositive; among African Americans 35% of men and 55% of women were positive; in the teenaged group the Caucasians showed a 4.5% seropositivity rate and the African Americans a 9% rate.

One of the few studies carried out in Canada, by Steve Sacks in Vancouver, investigated HSV rates among pregnant women and found that for those with one partner the seropositivity rate was 2%, whereas among those with > 10 lifetime partners the rate was 55%.

Globally, it has been reported that the seropositivity rate for HSV-2 among female sex workers is 60-90%. There has been an increase in HSV-1 infection in the genital area; studies from New York and the U.K. have shown that up to 70% of primary infections in women are caused by HSV-1. There is a strong association between HSV and HIV, and HSV increases the rate of HIV transmission. Treating HSV in people with HIV could present a rare problem, in that there may be development of resistance due to selection of strains that are TK (thymidine kinase) negative.

Western blot serology has been the best means of detecting HSV. Although it is a sensitive test and type-specific it has the drawbacks of being expensive and labour/resource intensive. Two new tests based on the gG (glycoprotein) of HSV may be available in the United States soon. These are the Chiron EIA, carried out in the laboratory, and another being developed by Diagnology that is carried out in the clinic and gives results within an hour. These are cheaper and less labour intensive than Western blot but not as precise. Clear guidelines need to be developed, particularly with the advent of these new tests, about whom should be tested and why, and what kind of counselling should be given to people found to be positive for HSV. Ashley and Wald[a] have discussed testing for diagnosis and screening.

A meeting was held in Atlanta in 1998 to delineate US goals with regard to HSV prevention. The most important issue to emerge was guidance on testing. Four objectives were proposed: (1) through a national campaign, increased awareness among physicians of genital herpes and diagnostic, treatment and counselling issues as well as greater awareness of the disease in the public; (2) guidance on type-specific serologic testing (i.e. whom should be tested and when); (3) guidance to prevent unnecessary cesarean sections carried out for pregnant women with genital herpes; and (4) guidance on routine screening of people seropositive for HIV.

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[a] Ashley RL, Wald A. Genital herpes: a review of the epidemic and potential use of type specific serology. *Clin Microbiol Rev* 1999;2(1):1-8.

Discussion at the Canadian meeting on goals for STD control led to the conclusion that baseline information is necessary against which the effectiveness of future vaccination programs can be evaluated. Data could possibly be gathered from unlinked serum surveys and cohort studies involving youth, pregnant women and men who have sex with men; there should also be a closer look at neonatal infections, which may tend to be underreported.

For the future, we need to provide guidance on the new serology tests and their implications, particularly in view of the likely strong effort from pharmaceutical companies to promote use of the tests. The impact of the tests should be evaluated not only in relation to cost and effectiveness, but also with regard to the sexual, social and psychological effects on people testing positive for HSV.

Rosanna Peeling

Viral STDs: Laboratory Diagnosis

Dr. Peeling stated that, as is the case with genital herpes, there are very few data in Canada on incidence rates of human papillomavirus, and yet the indications are that a rapid increase in rates has been taking place. It is becoming urgent to identify priorities in the prevention and control of this STD and to identify the tools available to achieve them. Dr. Peeling mentioned some possible methods:

- serum surveys (blood donors) }
- cohort studies (youth, STD clinics) } measuring the disease burden in Canada
- respiratory and laryngeal infections }
- prevention strategies (including education)
- research studies
  - genetic susceptibility to development of cervical cancer with certain HPV types
  - immunocompromised hosts
  - HPV types and cervical cancer (possibility of a registry including data on both)
  - co-factors
  - serological markers

Dr. Peeling invited discussion of these issues in the open panel session.

Panel Discussion

Dr. Patrick raised the possibility of gathering laboratory information on isolates positive for HSV in children less than six months old in order to get some idea of neonatal infection rates. The Canadian Paediatric Society carries out an annual survey of pediatricians to gather information on unusual infections. Dr. Embree stated that the CPS would be open to including specific infections, such as HSV, in its questionnaire. With regard to HPV, it was pointed out that any future surveys should target a range of women rather than one group, such as street youth, in whom rates are likely to be high. Pregnant women would be a good group to investigate, in that they are likely to represent a cross section of the population.

Dr. Jolly wondered whether tackling the viral STDs as well as trying to reach the goal of elimination of gonorrhea and syphilis would be spreading the energies of the current, somewhat small, group too thin. Strategically, it might be better to use the lessons learned once elimination has been achieved and to be able to show success in one area before moving on to deal with HSV and HPV.

Dr. Peeling pointed out that the initial step is to estimate the burden of disease due to viral STDs so that cost calculations can be made. Dr. Patrick disagreed that the viral STDs should await progress in other areas. He felt that resources could be available from other organizations than LCDC and the current group, and that the cost of testing specimens to estimate prevalence would not be very high.

Dr. Zou suggested that the Cancer Bureau at LCDC may be able to carry out some data linkage between cervical cancer and HPV, if these data are available on hospital discharge records.

After restructuring at the laboratory in Winnipeg, the field of viral STDs is now incorporated into the National Laboratory for STDs, and three people will be appointed to staff this section. Dr. King Ng and Dr. Peeling will ensure that there is collaboration between them and others working in the field.

STD Guidelines/Training and National Goals

Summary

Dr. Stephen Moses described a study that investigated whether health care providers in Manitoba comply with provincial guidelines on STD screening and treatment. Overall, 76% of 2,256 patients were treated on the basis of their symptoms and 24% on the basis of a prior laboratory report. Only 4% of PID cases received appropriate coverage for gonorrhea, chlamydia and anaerobes; 3% of PID cases received coverage for gonorrhea and chlamydia, although if the guidelines are relaxed slightly to allow single-dose treatment given orally, then the proportion rises to 61%. Screening for chlamydia needs to be promoted more strongly, particularly among high-risk groups.

Ms. Tina Karwalajtys and coworkers conducted a randomized controlled trial to determine whether a multifaceted approach to implementing chlamydia screening guidelines would increase compliance. The family/general practitioners exposed to a seminar on guidelines and case discussion, plus feedback in the following months, showed significantly greater compliance with guidelines than did practitioners in a control group.

Dr. Alex McKay presented the results of a survey of directors of programs of undergraduate medicine, family medicine, obstetrics/gynecology, urology and psychiatry. Most of the first three of these provide training in STD prevention, but few programs address sexual orientation, and only about half emphasize adolescent sexuality in their training. Of all programs surveyed, 39% do not include sufficient training to enable students to give effective sexual health education/counselling to patients.

Dr. David Patrick and **Ms. Louise Cormier** reported on completion of the *STD Guidelines*, a 200+ page document intended for specialists, and the *Highlights* of the guidelines, a quick, 20-page reference for use by physicians and nurses. Field testing of the *Highlights* guided the final content and format and was felt to have been a valuable exercise in improving this resource.

Dr. Tom Wong emphasized the need for professionals to be well trained in sexual health issues and STD control. Training options include an STD rotation at LCDC or provincial STD offices/clinics; training in professional schools; postgraduate medical training; and hands-on clinical and laboratory training.

Dr. Marc Steben described the self-learning modules that have been developed at the University of Montreal. The modules are practice based, and the case descriptions in them are structured so as to cover certain learning objectives specified at the outset. Field testing indicated that 99% of respondents would recommend the modules to colleagues.

Stephen Moses

STD in Manitoba: Evaluation of Provider Compliance with Screening and Treatment Guidelines, of Treatment Practices and Diagnostic Accuracy

This study, funded by LCDC, was carried out in 1996-98. The aims were to investigate to what extent health care providers in Manitoba comply with the province's guidelines on screening and treatment, and how accurate their diagnoses are. In Manitoba there are no longer centralized STD clinics.

The guidelines for STD management are as follows:

- The syndromic approach should be followed, i.e. treatment of urethral or cervical infection or suspected PID to be followed by laboratory testing.
- If gonorrhea is treated on the basis of a previous positive laboratory test, the patient should be treated for both gonorrhea and chlamydia; dual treatment is not indicated if chlamydia is treated on the basis of a previous positive laboratory test.
- Drugs used in the treatment of STD are freely available to prescribing physicians.
- All sexually active women (and men) under the age of 25 should be screened for chlamydia.

The specific objectives of the study were to determine (a) the level of provider compliance, (b) the proportion of cases treated presumptively as compared with the proportion treated after laboratory testing, (c) the proportion of these cases then referred for testing, (d) of those, the proportion confirmed as infected, (e) the proportion of women under 25 years screened for chlamydia and (f) the cost-effectiveness of azithromycin vs. doxycycline in the treatment of chlamydia.

All providers were asked to complete a record form for each new STD index case or contact treated, and linkages were then made with provincial laboratory, physician claim and administrative databases.

There were 156 providers who used the provincial STD drug program from September 1996 to December 1998 and, of these, 115 (74%) returned at least one case record form. On the basis of conservative estimates, only 27% of drugs from the provincial drug program could be accounted for, and even when underreporters – providers reporting 0 or < 10 cases – were not included, the proportions were still only 35% and 48% respectively. It is unclear whether this is due to under-reporting, drug waste, use of drugs for other indications or a combination thereof.

Table 1 Diagnosis (n=2,535)	
Presumptive Ng/Ct in case:	38.6%
Presumptive Ng/Ct in contact:	31.3%
Lab-confirmed Ct in case:	17.4%
Lab-confirmed Ct in contact:	4.6%
Lab-confirmed Ng in case:	1.4%
Lab-confirmed Ng in contact:	0.6%
Lab-confirmed Ct and Ng:	0.8%
Pelvic inflammatory disease:	4.0%
Other	1.7%

During 1997-98 it was found that 2,256 individuals were treated for an STD, of whom 63% were index cases and 37% sexual contacts. The mean age of the men was 28 years and of the women was 24 years. About 230 patients made more than one visit, for a total number of treatment visits of 2,535. The diagnoses are given in Table 1. Overall, 76% were treated on the basis of their symptoms, and 24% on the basis of a prior laboratory test result. Of those treated presumptively, it was reported that 94% were referred for laboratory testing, slightly more females than males and more index cases than contacts. However, from analysis of the laboratory test database only 75% could be confirmed as having been sent for testing after treatment.

Tables 2-3 show compliance with the guidelines for drug treatment. The proportion of correctly treated laboratory-confirmed gonorrhea cases was relatively low, particularly among contacts. Many patients with this infection were being treated with azithromycin or

Table 2 Compliance with Guidelines	
Presumptive Ng/Ct dx. in cases, treated for both Ng and Ct:	75.4% (N=970)
Presumptive Ng/Ct dx. in contacts, treated for both Ng and Ct:	70.1% (N=786)
Lab-confirmed Ct in case correctly treated:	97.9% (N=436)
Lab-confirmed Ct in contact correctly treated:	98.3% (N=115)
Lab-confirmed Ng in case correctly treated:	82.9% (N=35)
Lab-confirmed Ng in contact correctly treated:	50.0% (N=16)

Table 3 Compliance with Guidelines for PID, Strictly Interpreted (n=101)	
Correctly treated (Ng, Ct, anaerobes):	4.0%
Treated correctly for Ct only:	48.5%
Treated correctly for Ng and Ct only:	3.0%
Treated for Ct and anaerobes only:	6.9%
Other treatment:	37.6%

doxycycline, indicating that provider education is required in this area. Only 4% of PID cases received appropriate coverage for gonorrhea, chlamydia and anaerobes; 3% of PID cases received coverage for gonorrhea and chlamydia, although if the guidelines are relaxed slightly to allow single-dose treatment given orally, then the proportion rises to 61%.

Tables 4 and 5 give the data on screening rates for chlamydia, which are not very high among women and even lower among men. Physicians should be further encouraged to offer testing to any women under age 25 who visit their office, whatever the presenting symptom.

Overall, the "leakage" of provincially provided drugs needs to be investigated and new methods of supplying them considered. Laboratory-confirmed gonorrhea and PID treatment guidelines are not strictly adhered to, and additional education is needed for providers. Screening should be more strongly promoted, particularly among high-risk age groups.

Table 4
Screening Women in Manitoba for *C. trachomatis*, 1997

Age	Per cent screened of those receiving medical care	Per cent screened of the general population
< 15	0.5%	0.4%
15-19	20.5%	17.7%
20-24	29.2%	26.6%
25-29	24.6%	22.2%
30-39	13.8%	12.3%
40-49	4.9%	4.2%
> 50	0.7%	0.6%

Table 5
Screening Men in Manitoba for *C. trachomatis*, 1997

Age	Per cent screened of those receiving medical care	Per cent screened of the general population
< 15	0.1%	0.1%
15-19	2.9%	2.0%
20-24	5.3%	3.4%
25-29	3.8%	2.4%
30-39	2.2%	1.4%
40-49	1.0%	0.7%
> 50	0.2%	0.2%

Tina Karwalajtys

Improving the Implementation of Clinical Practice Guidelines for Chlamydia Screening: A Randomized Controlled Trial in Family Practice

This study, funded by LCDC and Pfizer Canada, was carried out in Ontario to determine whether a multifaceted approach to implementing chlamydia screening guidelines would affect family physicians' acceptance of and compliance with the guidelines.

The guidelines used were a combination of those put out by the Canadian Task Force on the Periodic Health Examination in 1996, and local guidelines validated by Dr. John Sellors in 1992.

The study was a randomized controlled trial with blinded outcome assessment. Family or general practitioners in Brant, Halton, Hamilton-Wentworth and Niagara were recruited who provided general, obstetric or gynecologic care to women 14-30 years and who were willing to record pelvic and prenatal examinations. They were stratified by sex.

The participants (n = 44) were randomly assigned to either a control group or a group that took part in a small, interactive seminar led by an opinion leader, in which the rationale, content and application of the guidelines were discussed and case studies of chlamydia infection were presented. Two observers evaluated 20 chart prompts (the pretested data collection and assessment tool) from each participant at three months' and six months' follow-up in order to determine compliance with the guidelines. Only the intervention group received feedback at three months, both of their own and of their peers' screening practices. At six months there was a further audit, and feedback was provided to both groups.

Table 1 shows the characteristics of participating physicians. Two of the intervention group withdrew, leaving a male to female ratio in that group of 65:35, as compared with 54:46 in the control group. No significant differences were found between the intervention and control groups.

Table 1
Description of Physicians & Practices

Characteristic	Intervention (N/20)	Control (N/24)
Gender	65% Male	54% Male
Median Age	47.5 (33-63)	47 (30-68)
Median Year of Graduation	1975 ('61-'91)	1978 ('54-'97)
Practice Type	55 % Solo	58 % Solo
Certification with CCFP	55 %	79 %
Remuneration Method	75 % Fee for Service	71 % Fee for Service
Academic Appointment	25 %	13 %

There was significantly greater compliance with screening guidelines in the intervention group at three months, 88.4% versus 80.4%, and also at six months, 84.5% versus 64.8% (Table 2). Table 3 gives the number of physicians showing 80% or higher levels of compliance with guidelines. At six months, 70% of physicians in the intervention group as compared with 33% in the control group were deemed to be ≥ 80% compliant ($p = 0.03$).

Table 2
Mean Compliance (Equal Variance of Groups Not Assumed)

Time of Audit	Mean Compliance %		p	Mean Difference	95% CI
3 Months	Intervention: Control:	88.4 80.4	0.049	7.9	0.0467–15.82
6 Months	Intervention: Control:	84.5 64.8	0.003	19.8	7.03– 32.47

Table 3
Percentage Compliance From +/- 80% Division Point

Time of Audit	Intervention (N/20)	Control (N/24)	p
	Physicians at >= 80 % compliance N (%)		
3 Months	18 (90%)	17 (71%)	0.15
6 Months	14 (70%)	8 (33%)	0.034

Overall, there was significantly greater compliance, both at three and six months' follow-up, among physicians who had participated in an educational intervention and received performance feedback. The volunteer nature of participation in the study may limit the generalizability of its results; nevertheless, it is hoped that this type of intervention can be applied in other areas besides chlamydia. With regard to chlamydia, the following questions remain for consideration:

- Has the real prevalence of chlamydia declined?
- Is selective sreening still appropriate, given that only 3% of screened patients under 30 years and only 1% of patients over 30 had positive test results?
- Have newer testing methods changed the detectable prevalence?

Alex McKay

STD Sexual Health Training in Canadian Medical Schools

Dr. McKay described the results of the first in a series of studies carried out by the Sex Information and Education Council of Canada (SIECCAN) into professional training in STD/sexual health education and counselling. The purpose of the study was to determine

the level and content of STD/sexual health training at medical schools, with a focus on prevention, education and counselling. The evidence has shown that physicians are deemed to be credible sources of information, particularly by adolescents, and are therefore well placed to encourage STD preventive strategies.

This was a survey of directors of programs in undergraduate medicine, family medicine, obstetrics/gynecology, urology and psychiatry, who were asked to complete an anonymous, 26-item questionnaire. The overall response rate was 84% (Table 1). For 19 topics, directors were asked whether they taught the topic at all, and if so whether they placed minimal, considerable or heavy emphasis on it.

Table 1
STD/Sexual Health Training in Canadian Medical Schools: Study Results

Sample & Response Rates	
Undergrad Med	13/16 = 81.2%
Family Med	16/16 = 100.0%
OBGYN	12/16 = 75.0%
Urology	8/11 = 72.7%
Psychiatry	13/15 = 86.7%
Total	62/74 = 83.8%

The results for all five programs are given in Table 2. Both undergraduate medicine and family medicine programs are emphasizing information and skills for HIV and STD prevention, although a few still do not give more than minimal coverage in these areas. In both undergraduate medicine and family medicine, however, few programs emphasize the topics of sexual orientation, adolescent sexuality or social and cultural differences in sexual norms, all of which are crucial components in STD prevention counselling as well as topics that physicians should feel comfortable discussing.

Table 2
STD/Sexual Health Training At Canadian Medical Schools: Survey Results

Topic area	No. (%) of Programs Placing Considerable or Heavy Emphasis on Topic				
	Undergraduate Medicine (n = 11-13)	Family Medicine (n = 14-15)	OBGYN (n = 12)	Psychiatry (n = 12)	Urology (n = 8)
Info & skills for HIV prevention	11 (85)	12 (80)	9 (75)	3 (25)	5 (63)
Physic/psycho aspects of HIV/AIDS	10 (83)	9 (64)	6 (50)	10 (83)	2 (25)
Info & skills for STD prevention (i.e. HPV, HSV)	10 (83)	11 (79)	9 (75)	0 (0)	5 (63)
Info & skills for pregnancy prevention	7 (64)	13 (93)	9 (75)	1 (8)	1 (13)
Sexual orientation	8 (62)	5 (63)	1 (8)	9 (75)	1 (13)
Adolescent female sexuality	6 (50)	9 (60)	3 (25)	5 (42)	0 (0)
Adolescent male sexuality	5 (39)	8 (53)	1 (8)	5 (42)	2 (25)
Social & cultural differences in sex norms	5 (39)	5 (39)	0 (0)	5 (39)	0 (0)

About three-quarters of the obstetrics/gynecology programs are emphasizing HIV and STD prevention, but surprisingly few (3 out of 12) apparently considered female sexuality to be an important topic, and none taught students about social and cultural difference in sexual norms. There was much less emphasis in psychiatry programs on HIV and STD prevention, but a higher proportion attached considerable or heavy emphasis to sexual orientation and adolescent sexuality. Urologists are dealing more and more with sexual dysfunction, particularly among males, and yet sexuality is not emphasized in the programs.

Knowledge of STDs has been changing fairly rapidly over the last 5-10 years, and some changes in program curricula might be expected to have taken place also. Table 3 shows the number of programs that have made revisions to their sexual health counselling over the past five years, and Table 4 the number of directors satisfied that their programs equip students for effective sexual health counselling.

Overall, the study results show the following:

- most undergraduate medicine, family medicine and OBGYN programs provide STD training
- 17% of undergraduate, 20% of family medicine and 25% of OBGYN programs provide minimal or no emphasis on STD
- few programs address sexual orientation (and STD implications)
- about half the programs do not emphasize adolescent sexuality
- of all programs surveyed, 39% do not provide sufficient training to enable students to provide effective sexual health education/counselling to patients

Table 3
No. & % of Canadian Medical School Programs that have made Changes to their Programing in Sexual Health Education and Counselling in the Past Five Years

Past Five Years	Undergrad	Family Med	OBGYN	Psychiatry	Urology
Changes Made	10(83%)	13(87)	5(42)	9(69)	4(50%)
No Changes	2(17%)	2(13%)	7(58%)	4(30%)	4(50%)
Changes for Better	9(90%)	13(100%)	4(80%)	9(100%)	4(100%)
Changes for Worse	1(10%)	0(0%)	1(20%)	0(0%)	0(0%)

Table 4
No. & % of Canadian Medical School Program Directors Agreeing or Disagreeing that their Programs Equip Students with the "Appropriate Knowledge, Motivation, and Skills for Effective Sexual Health Education and Counselling"

Response	Undergrad	Family Med	OBGYN	Psychiatry	Urology
Strongly Agree	1(8%)	1(7%)	1(8%)	0(0%)	0(0%)
Agree	5(42%)	12(80%)	5(50%)	7(58%)	3(38%)
Disagree	5(42%)	1(7%)	4(33%)	5(42%)	4(50%)
Strongly Disagree	1(8%)	1(7%)	1(8%)	0(0%)	1(13%)

David Patrick, Louise Cormier

STD Guidelines

The 1998 edition of the *STD Guidelines* is complete, and Dr. Patrick acknowledged all the many contributors to their development and production. The *Guidelines* will need to be not only disseminated but also promoted and evaluated. The evaluation component will cover how users rate the *Guidelines* on usefulness and ease of use, and ideally there will also be some measure of whether they influence actual behaviour.

Louise Cormier described the *Highlights* (of the *STD Guidelines*) document as a user friendly, quick reference (20 pages) for physicians and nurses, in contrast to the *Guidelines*, which are intended for use by STD specialists, pediatricians, obstetricians/gynecologists and urologists, and are over 200 pages long. Field testing was carried out to establish the value of the *Highlights* and obtain feedback on the content and format. A short questionnaire was mailed to 244 physicians and nurses with a draft, black and white copy of the document. To boost cooperation with the survey, a copy of the final version of the *Highlights* and of the *STD Guidelines* was given to those who returned the questionnaire.

The response rate was 54.5% (133/244), with a range of 30-92%; 43% of respondents were family physicians and 30% were public health nurses. Since there had been discussion at the committee stage of whether to include decision trees in the *Highlights*, respondents were asked their opinion on these: 76% stated that their inclusion would be useful and practical. Most respondents preferred a pocket book type of format or the draft format that they had received rather than other formats (Table 1). Table 2 shows that 94% would not rely only on the Internet version of the *Highlights* but would wish to retain the hard copy.

Table 1
Results : Format

Format Preferences	(+ answers)
Wall chart	25
Pocket Book	67
B/W draft format (used for field test)	63
CD-ROM	14
Other	12

Table 2
Results : Use of Internet

- 51.1% (68/133) use Internet for info.
- 54.1% (72/133) would use the *Highlights* if posted on Internet.
- 94% (125/133) would not use the internet version to replace the hardcopy . 6% (8/133)-> Internet version will replace the hardcopy.

The cost of field testing the *Highlights* was about 12% of the total cost of production ($7,700 of $65,000). Each copy was estimated to have cost about $0.85. Field testing was felt to have been a valuable exercise in improving this resource.

Tom Wong, Marc Steben

STD National Training

Several presentations have made the point that clinical and public health professionals are often lacking expertise in the field of sexual health and STDs. Dr. Wong emphasized that for Canada to reach the national goals that have been set for the coming years these professionals need to be well trained, and yet training in this country is, on the whole, limited.

The *STD Guidelines* and the *Highlights* are two documents that have the potential to further STD training in Canada; for instance, they could form the basis of continuing medical education courses. Other training options include an STD rotation at LCDC, provincial STD offices or STD clinics; training in professional and nursing schools; postgraduate medical training; videoconferencing; and hands-on clinical and laboratory training. To reach practitioners in every area of Canada, training could involve self-learning STD modules, available in hard copy, CD ROM or on the Web site. To be effective these need to be case-based, visual and interactive. LCDC is currently investigating the possibility of putting clinical and microbiologic slides on the Web site and linking them with the *STD Guidelines* and *Highlights*.

Dr. Steben described the self-learning modules that have been developed at the University of Montreal's unit for research and development into medical education. Of the 30 produced so far, only one, the genital herpes module, has been translated into English. The modules are practice based, and the case descriptions in them are structured so as to cover certain learning objectives specified at the outset.

To test the modules, study credits were given to practitioners who completed a pre- and post-module test and returned a questionnaire. When asked what effect on their practice the module would have, many respondents said that there would be changes with regard to counselling. The module's strongest point was felt to be the colour pictures, which could be used for comparison purposes in the clinic. Of all respondents, 99% reported that they would recommend the module to a colleague; less than 30% felt the need for more information, and for those who did this was usually local information, such as where to obtain free drugs for patients. This kind of module would provide the type of study credits (type C) that the Canadian College of Family Physicians is now asking of its graduates.

Panel Discussion

Dr. Fisher made the comment that the *STD Guidelines* includes a "script" that clinicians can use to open up their discussions with clients about sexual issues, explaining that it is part of their job to help in areas of sexual and reproductive health and they will need to ask a few related questions. This could be seen as the first step for many physicians in their STD training. It may lead to further changes, for example, in comfort level, and a desire to seek more information, perhaps through continuing medical education. Dr. Patrick pointed out that there already are scripts in use, for example in the field of HIV counselling, and suggested that it should not be too difficult to train medical students to routinely ask questions about sexual health in the same way as they are taught to enquire about the nature of chest pain.

In the experience of Dr. Myers there is a lack of support and appreciation from university colleagues for the issues of concern to those working in sexual health, and the students themselves do not see how sexual health is a relevant part of public health. If governments were to provide more resources in the form of training or research grants then this perception might shift somewhat.

Dr. Fisher mentioned the *Canadian Guidelines for Sexual Health Education*, which could be viewed as a companion document to the *STD Guidelines*. As opinion leaders/educators, clinicians are in a position to suggest *the Canadian Guidelines* as a source of what could be taught in non-clinical settings.

In the United States, CDC has been promoting a national curriculum with training centres for upgrading of skills. Dr. Steben suggested that in this country, parts of the *STD Guidelines* and the principles of self-learning modules could be used to form the basis of a national curriculum for medical or nursing students. It was pointed out by Dr. Haiek that initiatives such as the *STD Guidelines* and CME will influence perhaps a select group of clinicians, and many others will not be reached. There needs to be an analysis of factors that might facilitate physician involvement, and development of new strategies to engage them.

Dr. Wong stated that the Society of Obstetricians and Gynecologists has the goal of increasing the use of computers in their members' offices; they hope to see a computer in each office by the year 2005, to be used both for billing and for CME and educational projects. With LCDC, the Society will be enhancing the training of gynecologists through CD ROM, Web-based tools and CME activities.

Dr. Steben believed that physicians need to be made aware of the changes that have been introduced into the *Guidelines*. Dr. Wong asked for comments about how provinces are helping physicians or other professionals to use them. One example was given of sessions held for clinicians and their staff at which updates on hepatitis C, varicella vaccination, etc. were presented, and 15 minutes were allowed for introduction of the *Guidelines*. Dr. Patrick mentioned that 25 CME sessions around British Columbia have focused on the changes in the *Guidelines*, and public health nurses have also been brought up to date on the changes.

Higher Risk Populations and National Goals

Summary

Ms. Susanne Shields outlined the objectives and results of a pilot project investigating risk factors and outcome among street youth in Halifax, Ottawa and Vancouver. The overall prevalence rate of chlamydia was 9.95%, and the highest rate, 20%, was in Ottawa. Youth in these cities differed on several parameters, for instance, problems with the law and injection drug use. The enhanced surveillance of Canadian street youth was expanded to include multiple sites across Canada.

Dr. Céline Poulin reported on the results of two studies investigating the feasibility of an STD screening and treatment program among (1) drug users attending a needle exchange program and (2) high-risk individuals attending community organizations in Quebec City. In the first study, the prevalence of chlamydia was 3.1% among men and 4.0% among women. Risk factors associated with STD among women were age between 20 and 24 and unprotected sex with commercial partners. Cocaine use in the previous six months and first intercourse before age 13 were significant factors in non IDU women. In the second study, the prevalence of gonorrhea and chlamydia were 1.1% and 5.8% respectively; rates were higher among participants aged < 20 years. In that age group, infection was significantly associated with all injection drug use, intercourse before the age of 13 and casual partners within the previous six months.

Dr. Laura Haiek and coworkers conducted a randomized controlled trial to evaluate an intervention ("cascade-to-peers") to increase condom use among teenaged girls attending adolescent clinics in Montérégie. In the experimental group each participant met three times with two friends to go over educational material about STD. Questionnaires were completed on sociodemographic information and sexual history. Overall, age at initial sexual relations was 14, and condoms were used in about 52% of sexual encounters before the intervention took place. Results on condom use six months afterwards — the outcome variable — are not yet available.

Dr. John Kim discussed the features of human T cell leukemia/lymphoma virus (HTLV), the first human retrovirus described. Both HTLV-1 and HTLV-2 can be transmitted sexually, and this is probably the commonest route for HTLV-2. HTLV-1 is associated with adult T-cell lymphoma and myelopathy; HTLV-2 may result in hairy cell leukemia and neurologic

disorders. If a screening assay for HTLV is repeatedly reactive, then Western blot or radio-immunoprecipitation is carried out. PCR-based technology can distinguish between HTLV-1 and HTLV-2.

Dr. Stephen Moses described a Winnipeg survey of people with a history of STD. About 20% of the sample reported that first intercourse had been involuntary, at a mean age of 12.5 years. Overall, a high prevalence of risk factors was found. Predictors of risk behaviour were male sex, younger age, involuntary first intercourse and drug or alcohol use with sexual activity.

Drs. Neil Heywood and **Ron St. John** discussed the current requirement that immigrants found to be positive for syphilis, having undergone treatment in their home country, must also be referred for surveillance once in Canada. As a result of the Montebello Process, it was decided to use decision tree analysis to examine the costs associated with various screening conditions for a number of diseases. In the case of syphilis, at a prevalence of 17.5 per 100,000 and a treatment failure of 0.01, the lowest cost is screening immigrants and excluding those infected; however, if treatment is completely reliable, the costs of screening to exclude and screening to include are the same.

Susanne Shields

Enhanced STD Sentinel Surveillance in Canadian Street Youth

In 1988 the Canada Youth and Aids Study was launched to investigate knowledge and attitudes towards HIV and AIDS among youth. One of the study findings was that 56% of street youth were concerned about infection with HIV, and yet only 7% were worried about STD, despite the high rates, for example, of chlamydia among women aged 15 to 24. Early family abuse contributes towards youth leaving home, and life on the street then puts them at higher risk of substance abuse, early sexual activity and STD.

A pilot project was undertaken to monitor (a) risk assessment and management and (b) risk factors and outcome among street youth. The study was carried out at drop-in centres in Vancouver, Ottawa and Halifax. Street youth were defined as those between ages 15 and 24 years who had been absent from home for at least one night. A urine sample was obtained from each participant for chlamydia testing, and a questionnaire was administered.

The total sample consisted of 294 youth, 200 male and 94 female; 116 were from Vancouver, 109 from Ottawa and 69 from Halifax. The average age of the youth was 16.4 years; 64% grew up in the city; and about 50% grew up in a different city from the one they were currently living in. With regard to education, 7.6% had achieved grade 8 or less, and 83.7% had achieved grade 9-12. It was found that 18% of youth had left home because of fighting in the house, and 14% because of problems with parents. Problems with the law were described by 74% of participants, those in Vancouver reporting significantly more than participants in the other two sites; 42% of crimes were crimes against property.

Overall, 93% had used street drugs, and 26% had injected street drugs: 3% in Halifax, 37% in Vancouver and 26% in Ottawa.

Table 1 presents the data on chlamydia testing of the urine samples. The overall prevalence rate of chlamydia was 9.95%, and the highest rate, 20%, was in Ottawa.

Table 1 **Pilot Study: Results** **Prevalence of Chlamydia**
65% (191/294) provided urine samples • 67% Halifax, Nova Scotia • 32% Ottawa, Ontario • 95% Vancouver, British Columbia
9.95% (19/191) prevalence rate • 11% (5/46) Halifax, Nova Scotia • 20% (7/35) Ottawa, Ontario • 6% (7/110) Vancouver, British Columbia • 5 participants were involved in the study due to their partners testing positive for chlamydia.

In the area of sexual experience, 95% had ever had a sexual encounter, 88% had had sexual activity in the previous 12 months, and for 71% there had been between one and five partners in the previous 12 months; 70% overall, but particularly participants in Halifax, reported having a regular sexual partner; and 32% overall had had sex against their will. Table 2 presents information on a history of STD testing, and shows that in 21% an STD had been diagnosed (of which 46% was chlamydia). Significant events that had taken place in the previous 12 months are shown in Figure 1, and Table 3 highlights the differences between cities in this respect.

Table 2 **Pilot Study: Results STD** **Knowledge and Rates**
71% report having been tested for an STD.
69% report the reason for getting tested was they just wanted to be sure.
21% report being diagnosed with an STD. • 46% reported having chlamydia • 90% reported knowing that an STD can affect their ability to have children. • 97% report knowing that an STD can affect health in general.

The results showed that street youth in these three cities differed on many parameters, and that to gain a national perspective more cities need to be included. It was decided that the enhanced surveillance of Canadian street youth should be expanded to include multiple sites across Canada. Some of the questions were modified to further investigate particular issues; the age range was extended to include 14 year olds; and to be included youth had to have been away from home for at least three nights. As well as a urine sample, participants were

Figure 1
Pilot Study : Results

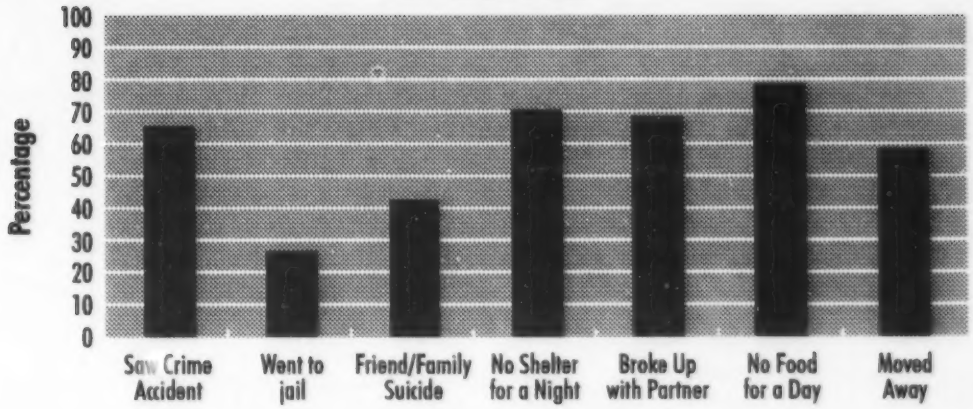


Table 3
Pilot Study: Methods
Which of the Following has Happened to you in the Last 12 Months?

- Youth reported seeing more crime in VC and OT. p=.036
- More youth in VC reported going to jail. p=.001
- Youth in NS reported having less friends attempting suicide. p=.018
- Youth reported having no shelter more often in VC. p=.008
- Youth in OT reported more breakups with a partner. p=.003
- Youth in VC reported having moved more often. p=.01

asked to provide blood for hepatitis B testing. Testing will later be carried out for herpes, HIV, HTLV, hepatitis C and G, TTV and HPV. The objectives of this study, which is ongoing, are given in Table 4.

Table 4
Enhanced Surveillance: Methods

Objectives:

- To determine the prevalence rates and trends of STD in Canadian Street Youth
- To describe and monitor determinants of Canadian youth leaving home and becoming street-involved
- To describe socioeconomic and demographic characteristics, and the risk behaviour of Canadian Street Youth
- To describe and monitor the attitudes and perceptions of street youth concerning safer sex, risk behaviour and the consequences of unprotected sex and determine if the trend changes over time
- To assess barriers to STD diagnosis, treatment and partner notification
- To evaluate the performance of commercially available urine tests

Céline Poulin

Feasibility of STD Screening and Treatment Program Among Drug Users Attending a Needle Exchange Program in Quebec City

The objectives of this study were (a) to determine the prevalence of chlamydia and gonorrhea among drug users attending a needle exchange program, Points de repères, in Quebec City, and (b) to identify associated risk factors. Points de repères has offered services to1,500 injecting or non-injecting drug users each year since 1991 at a fixed site, on the street, in shooting galleries and in jail. Its services include the following:

- education on STD and HIV prevention
- needle exchange and condom distribution
- referral to support services and drug rehabilitation
- HIV testing and counselling
- vaccination against hepatitis B

All attendees of the program were invited to participate in the study. Those agreeing gave written consent and provided a urine sample for PCR testing for chlamydia and gonorrhea. As well, subjects were asked to complete a qustionnaire on risk behaviour and medical history. They were informed of the test results within 10 days and were offered a medical examination and free treatment at Points de repères.

A total of 730 sexually active subjects participated, 482 men and 248 women. Socio-demographic characteristics are shown in Table 1. Men were older than women, and were more likely to have been in prison or to be current IDU. Male IDU were more likely to have a history of hepatitis and self-reported HIV infection than male non-IDU; they were also

Table 1
Socio-Demographic Characteristics of Participants

	Men (n=482)	Women (n=248)	P Value
Mean (SD) age (Years)	29.7 (10.1)	25.4 (9.5)	< 0.01
	%	%	
Attending NEP for ≤ 2 years	53.5	64.5	< 0.01
Ever incarcerated	58.3	34.0	< 0.01
HIV-positive	5.2	6.1	NS
Ever injected drugs	67.4	52.4	< 0.01
Currently injecting drug use	51.7	38.7	< 0.01
In previous 6 months, have used			
Cocaine	68.9	56.5	< 0.01
Heroin	12.0	11.3	NS
PCP	43.2	48.0	NS

more likely to have unprotected sex, particularly with high-risk sexual partners (Table 2). Among women, more IDU than non-IDU reported a history of hepatitis and other STD. They were more likely to have had more than five heterosexual partners in the previous six months and to have been paid for sex; as well, their rates of unprotected sex were generally higher (Table 3).

Table 2
Sexual Behaviours of 482 Sexually Active Male Participants in an STD Prevalence Study at Points de Repères, Quebec City

	IDU (n=249) %	Non-IDU (n=233) %	P Value
First intercourse < 13 years old	17.7	20.2	NS
History of hepatitis	33.1	6.9	< 0.01
History of other STDs	37.0	31.9	NS
History of same sex partners	39.7	19.4	< 0.01
In the previous 6 months			
• Heterosexual partners			
0	19.3	20.7	
1	32.5	31.0	
2 to 5	36.1	37.9	
> 5	12.0	10.3	NS
• Vaginal sex with:			
Casual partners	47.8	45.9	NS
Inconsistent condom use	71.4	73.8	NS
Regular partners	40.2	48.5	0.08
Inconsistent condom use	78.0	80.5	NS
History of unprotected sex with:			
• IDU partners	49.4	19.7	< 0.01
• Homosexual/Bisexual men	19.7	9.4	< 0.01
• Prostitutes	32.5	21.5	< 0.01
• HIV positive partners	7.6	2.6	0.02
• Persons with multiple partners	69.1	59.2	0.03

Among men there were no cases of gonorrhea. The seroprevalence of chlamydia was 3.1%: 2.4% and 3.9% among male IDU and non-IDU respectively. Factors associated with chlamydia infection in men were first intercourse before 13 years of age and having a regular sexual partner in the previous six months, both among non-IDU only.

Among women the prevalence rates of gonorrhea and chlamydia were 1.2% and 4.0% respectively. The overall STD rate among IDU was 6.3% and among non-IDU was 4.6%. Factors significantly associated with infection were found only among the non-IDU women and included having attended the program for more than two months, having used cocaine in the previous six months and having first intercourse before 13 years of age. In a stratified analysis controlling for injection drug use, prevalence was higher among women who were

Table 3
Sexual Behaviours of 248 Sexually Active Female Participants in an STD Prevalence Study at Points de Repères, Quebec City

	IDU (n=296) %	Non-IDU (n=152) %	P Value
First intercourse < 13 years old	17.8	10.5	NS
History of hepatitis	44.8	2.6	< 0.01
History of other STDs	49.0	31.6	< 0.01
In the previous 6 months			
• Heterosexual partners			
0	2.1	8.6	
1	21.9	46.1	
2 to 5	35.4	36.2	
> 5	40.6	9.2	< 0.01
• Vaginal sex with:			
Commercial partners	41.7	4.6	< 0.01
Inconsistent condom use	32.5	42.9	NS
Casual partners	46.9	35.5	NS
Inconsistent condom use	62.2	66.6	NS
Regular partners	70.8	71.7	NS
Inconsistent condom use	82.3	81.5	NS
History of unprotected sex with:			
• IDU partners	69.8	24.3	< 0.01
• Bisexual men	16.7	7.2	0.03
• Prostitutes	18.8	6.6	< 0.01
• HIV positive partners	10.4	1.3	< 0.01
• Persons with multiple partners	68.8	63.8	NS

20-24 years of age and those who had had unprotected sex with commercial partners than among women who had not.

Table 4 shows the results of a multivariate analysis of factors associated with STDs in which interaction of the different risk factors of gender and injection drug use was systematically considered. Among women, age between 20 and 24 years and unprotected vaginal sex with commercial partners remained significant factors; among participant non-IDU, cocaine use in the previous six months and first intercourse before 13 years of age were significant. Among male non-IDU, having had a regular sexual partner within the previous six months was significantly associated with an STD. This is a surprising finding, although more than half of this group had had several sexual partners within that time and few of them consistently used condoms.

Table 4
Variables Associated with STDs in a Logistic Regression Model Among Participants in an STD Prevalence Study at Points de Repères, Quebec City

	Adjusted Odds ratio	95% CI	P Value
Aged between 20 and 24 years			
• Men	2.10	0.65 - 6.79	NS
• Women	6.47	1.69 - 24.73	< 0.01
Cocaine use			
• IDUs	0.46	0.05 - 4.27	NS
• Non-IDUs	5.34	1.58 - 18.05	< 0.01
First intercourse < 13 years of age			
• IDUs	0.64	0.12 - 3.57	NS
• Non-IDUs	6.11	1.99 - 18.78	< 0.01
In the previous 6 months			
• unprotected vaginal sex with commercial partners			
Men	NA	NA	NA
Women	7.54	1.36 - 41.98	0.02
• Having regular sexual partners			
Women non-IDUs	1.10	0.16 - 7.49	NS
Women IDUs	2.80	0.28 - 28.05	NS
Men non-IDUs	9.72	1.14 - 82.74	0.04
Men IDUs	1.57	0.31 - 8.03	NS

Céline Poulin

Feasibility of an STD Screening and Treatment Program among High-risk Persons Attending Community Organizations in Quebec City

Street youth, prostitutes and women with social problems or delinquent behaviour show high-risk behaviours that could make them a core group for STDs. The objectives of this study were to (a) determine the prevalence of gonorrhea and chlamydia among people attending community organizations in Quebec City and (b) to identify associated risk factors among this population.

The study sample comprised women attending the Centre régional de dépistage anonyme du VIH (CDA-VIH) and people attending four community organizations:

- women attending a women's centre because of delinquent behaviour or social problems
- women living in an external unit as an alternative to incarceration following a court order

- young women and men involved in prostitution
- street youth

All of the individuals attending community organizations were invited to participate in the study. Of women at the CDA-VIH, those who had symptoms of STD or recent contact with an infected person were included, as well as women with at least two of the following risk factors: age < 25 years; abortion in the previous year; unprotected sex with two or more partners in the previous year or having a partner who had had unprotected sex with two or more partners in the previous year; and a history of STDs. After written consent, subjects were asked to complete a questionnaire on risk behaviours and medical history, and to provide a urine sample for PCR testing for gonorrhea and chlamydia.They were informed of the test results within 10 days and were offered a medical examination and free treatment.

Table 1 shows some of the sociodemographic characteristics of participants. Men were younger than women and were more likely to have been in prison. Injection drug use in the previous six months was reported by 24% of men and 16% of women.

Table 1
Socio-Demographic Characteristics of Participants

	Men (n=233)	Women (n=393)	P Value
Mean (SD) age (Years)	19.7 (3.7)	25.8 (9.9)	< 0.01
	%	%	
Ever incarcerated	69.0	44.3	< 0.01
Ever HIV tested	46.1	61.8	< 0.01
• HIV-positive (if tested)	3.0	5.1	NS
In previous 6 months			
• Alcohol	84.9	76.0	< 0.01
• Cocaine	49.1	30.9	< 0.01
• Heroin	14.2	8.7	0.03
• PCP	63.4	36.5	< 0.01
Ever injected drugs	43.8	27.4	<0.01
Currently injecting drug use	23.9	15.6	< 0.01

A history of STDs and of same sex partners was more common in older than younger men (Table 2), but the younger participants were more likely to have had first intercourse before age 13, and to have had at least two heterosexual partners in the previous six months. Among women, again the younger group was significantly more likely to have had first intercourse before age 13 and at least two partners in the previous six months (Table 3); as well, sex with casual partners and unprotected sex with IDU partners was more common in this group. Women in the older age group were more likely to have a history of STDs.

The overall prevalence rates of gonorrhea and chlamydia were 1.1% and 5.8%. There were no significant differences between men and women in STD prevalence, but the rate was higher among subjects younger than 20 years (11.4% vs. 3.6%).

Table 2
Sexual Behaviours of 233 Sexually Active Male Participants in a Community-based STD Prevalence Study in Quebec City

	< 20 years (n=132) %	> 20 years (n=101) %	P Value
First intercourse < 13 years old	33.6	18.2	< 0.01
History of other STDs	13.0	31.0	< 0.01
History of same sex partners	4.6	15.0	0.01
In the previous 6 months			
• Heterosexual partners			
None	6.1	12.0	
1	20.6	39.0	
2 to 5	51.1	32.0	
> 5	22.2	17.0	< 0.01
• Vaginal sex with:			
Casual partners	59.7	46.9	0.08
Inconsistent condom use	74.0	67.4	NS
Regular partners	54.6	57.6	NS
Inconsistent condom use	77.8	82.5	NS
History of unprotected sex with:			
• IDU partners	20.7	18.4	NS
• Homosexual/Bisexual men	5.1	12.2	NS
• HIV positive partners	0.0	6.9	NS
• Persons with multiple partners	44.2	46.0	NS

Table 3
Sexual Behaviours of 393 Sexually Active Female Participants in a Community-based STD Prevalence Study in Quebec City

	< 20 years (n=132) %	> 20 years (n=261) %	P Value
First intercourse < 13 years old	29.6	8.9	< 0.01
History of other STDs	23.9	42.2	< 0.01
In the previous 6 months			
• Heterosexual partners			
None	3.8	14.1	
1	20.5	44.8	
2 to 5	54.6	34.7	
> 5	21.2	6.4	< 0.01
• Vaginal sex with:			
Commercial partners	9.2	8.7	NS
Inconsistent condom use	75.0	59.1	NS
Casual partners	64.6	41.5	< 0.01
Inconsistent condom use	83.3	75.2	0.08
Regular partners	72.3	66.7	NS
Inconsistent condom use	88.3	90.6	NS

Table 3
Sexual Behaviours of 393 Sexually Active Female Participants in a Community-based STD Prevalence Study in Quebec City

	< 20 years (n=132) %	> 20 years (n=261) %	P Value
History of unprotected sex with:			
• IDU partners	52.7	24.7	< 0.01
• Bisexual men	8.6	11.1	NS
• HIV positive partners	6.2	4.0	NS
• Persons with multiple partners	75.0	72.7	NS

Table 4
Univariate Analysis of the Associations Between Infection by either *N. gonorrhoeae* or *C. trachomatis* and Selected Characteristics Among Participants of Less than 20 Years of Age in a Community-based STD Prevalence Study in Quebec City

Variables	n	% Positive	POR	P Value
Sex:				
• Men	132	8.3	1	
• Women	132	14.4	1.8	NS
In the previous 6 months				
• Cocaine use				
No	135	8.2	1	
Yes	129	14.7	1.9	0.09
• Heroine use				
No	226	9.3	1	
Yes	38	23.7	3.0	0.01
• Injection drug use				
No	193	7.8	1	
Yes	59	23.7	3.7	< 0.01
• First intercourse:				
< 13 years old	83	16.9	2.1	
> 13 years old	180	8.9	1	0.06
• Number of heterosexual partners				
0 or 1	66	4.6	1	
2 to 5	139	10.8	2.3	
> 5	57	21.1	4.4	< 0.01
• Commercial sexual partners				
No	120	14.2	1	
Yes	12	16.7	3.3	NS

Among youth aged less than 20, infection was significantly associated with heroin use in the previous six months, with all injection drug use, with intercourse before the age of 13, and with casual partners in the previous six months (Table 4). There was a significant trend towards a greater proportion of STD infection with increasing number of heterosexual partners in the previous six months. For subjects older than 20 years no significant associations

Table 5
Variables Associated with STDs in a Logistic Regression Model Among Participants in a Community-based STD Prevalence Study in Quebec City

	Adjusted Odds ratio	95% CI	P Value
Aged < 20 years	2.77	1.36 - 5.63	0.005
In the previous 6 months			
• Injection drug use	2.86	1.45 - 5.63	0.003
• Casual sex partners	2.81	1.29 - 6.14	0.01

were found. A multivariate analysis revealed that age less than 20 years, having injected drugs and having casual sexual partners in the previous six months remained significantly associated with STDs (Table 5).

Despite their high-risk behaviour, older women showed a relatively low STD prevalence. They are more likely to attend and be screened by their own physicians. However, there was a high prevalence of STDs among street youth and young drug users. Community-based STD screening and treatment services appear to be acceptable to this high-risk group. Indeed, of 43 infected subjects, 38 were treated, three were informed of the positive result although it is not known whether they attended for treatment, and two could not be traced. Partner notification in this population would provide a good opportunity to reach infected people who are part of a core group in STD transmission.

Laura Haiek

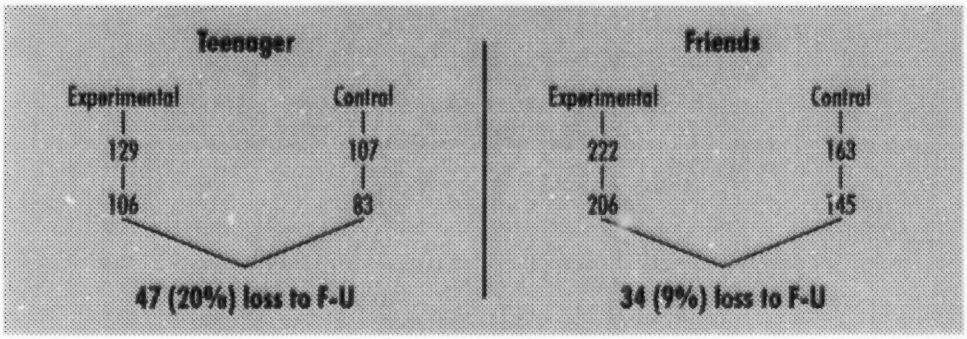
Promoting Condom Use in Adolescent Clinics of the Montérégie Region, Québec

Dr. Haiek and colleagues had noticed that once the contraceptive pill was prescribed for teenaged girls in adolescent clinics the rate of condom use substantially declined. In 1992 a pilot project in two of the clinics showed that the positive effect of an intervention found after three months had disappeared after six months. Funding from Health Canada allowed expansion of the study and use of a "booster" intervention after three months.

The objective of this expanded, ongoing study was to evaluate an intervention to increase condom use among teenaged girls attending 10 CLSC-based adolescent clinics in the Montérégie region (south shore of Montreal) and their friends. It was a randomized controlled study in which the experimental group participated in a "Cascade-to-peers" intervention, involving four meetings of each participant with two of her friends. Subjects in the control group were involved in similar meetings but were given a control task. Both groups were followed up after six months.

The subjects were aged between 14 and 18 and were sexually active. Girls in the experimental group were provided with educational material at the clinic, which they were to take home. They chose two best friends with whom to have three meetings of about an hour each

Figure 1
Implementation Process and Losses to Follow-up



in which to cover the material. These were to take place in the home, unsupervised, within three months. Booster material was sent to them after three months, and a final meeting was held within the following three months. Questionnaires were completed by telephone before and after the intervention. The control group had one meeting within the first three months, and another during the second period of three months. All participants were asked about intercourse, pill and condom use in the three months before the intervention and at the end of the follow-up period of six months. The outcome variable was percentage condom use at six months. Psychosocial predictors of condom use, including attitudes, subjective and moral norms, self-efficacy and intention were also measured at six months.

There were 621 participants (including control subjects and friends). Figure 1 shows the split in numbers and losses to follow-up (which occurred mainly at the beginning of the study) so far. Table 1 gives some of the socioeconomic information on the participants. They were on average 16 years old, and had undergone nine years of education. About 78-80% of the girls had had sexual relations; the 20% who were not sexually active were the friends of participants, and this could not be controlled for. Of those who were sexually active the age at initial sexual relations was between14 and 15 years (or 14.5), and the approximate number of partners was three; in about 52% of sexual encounters a condom was used

Table 1
Socioeconomic Characteristics

Variable	Experimental (n=351)	Control (n=270)
Education (years)	9.3 ± 1.4	9.2 ± 1.5
Age (years)	16.7 ± 1.6	16.1 ± 1.3
Education (<12 years)		
• Father	69.4%	69.6%
• Mother	65.5%	69.5%
Source income (work)		
• Father	80.3%	83.6%
• Mother	77.6%	80.8%

Table 2 Condom use at (t_0)						
Type of penetration	Experimental			Control		
	N	# rel.	% condom	N	# rel.	% condom
Vaginal	221	18.7	55.2	172	22.4	52.4
Anal **	20	3.7	22.2	16	7.5	56.2
Oral	74	9.3	3.4	71	7.5	1.2
** $p<0.05$						

Table 3 Sexual Behaviour at (t_0)		
Variable	Experimental (n=227)	Control (n=181)
# of sexual relations	21.6 ± 26.0	24.9 ± 31.1
% rel. with condom	49.7 ± 42.9	45.6 ± 42.1
% rel. with pill	58.5 ± 47.2	60.8 ± 47.4
% rel. condom & pill	31.5 ± 38.9	34.5 ± 39.3

(Table 2). Sexual behaviours during the three months before the intervention are shown in Table 3. Condoms were used in 45-50% of sexual encounters; in about 32-35% of sexual contacts both the pill and the condom had been used. Results on condom use at six months are not yet available.

The study's strengths are in its experimental design, relevant control task and long follow-up. The greatest drawback is lack of control over the intervention itself.

John Kim

HTLV: Implications in Higher Risk Populations

The National HIV Reference Laboratory, Bureau of HIV/AIDS, STD and TB, Health Canada, performs supplementary or confirmatory testing for HTLV-I (human T cell leukemia/lymphoma virus) and II based on serological and nucleic acid assays. There is a lack of data on Canadian rates of HTLV, and although the prevalence of infection with these viruses may not be as high in Canada as that of other viral or bacterial STDs, information is necessary to establish a national baseline.

HTLV-I and II were the first human retroviruses described, in 1980 and 1982, and belong to the oncovirus subfamily of retroviruses. HIV used to be called HTLV-III, but it belongs to a different subfamily and, in contrast to HTLV, kills T cells. HTLV-I is endemic in some parts of Japan, the Caribbean and West Africa, where the prevalence is up to 15%. In the United States, prevalence rates can be high among immigrant populations and African Americans in the south-east. Estimates of the prevalence in the US blood supply range from 0.016% to

0.1%. Most cases of HTLV-I infection in blood donors are linked with endemic areas, either through birth or sexual contact with someone from that area; a very small proportion are associated with intravenous drug use. Infection with HTLV-II is more commonly found among IDUs. Blood donors infected with HTLV-II usually have a history of intravenous drug use or sexual contact with IDUs.

HTLV-I can be transmitted vertically, sexually (male to female) or by blood transfusion (blood cell products). There is good evidence that it can be transmitted by breast feeding. Sexual transmission is probably the most common form of transmission of HTLV-II.

There are two disease types associated with HTLV-I, the first involving adult T-cell lymphoma, and the second HTLV-I-associated myelopathy. In only about 5% of carriers of the virus will lymphoma develop. The median age of those with the disease is 50 years, the cells affected are the CD4 cells, and chemotherapy is ineffective (median survival < 1 year). It is less clear what the disease consequences are of HTLV-II, but hairy cell leukemia and neurologic disorders are possibilities.

Laboratory testing for HTLV generally begins with a screening assay, usually EIA or ELISA. If the assay is repeatedly reactive, confirmatory or supplementary tests are carried out (Western blot or radio-immunoprecipitation). The second class of testing is PCR-based, and this can differentiate between HTLV-I and HTLV-II. A commercial assay by Roche is specific for the *pol* gene. In-house assays at the National Reference Laboratory target the *pol* and the *tax* gene. In some small studies the prevalence rates have been found to be much higher with the use of PCR assays that target the *tax* gene as compared with EIA. There is a large multicentre collaborative study being carried out in the United States in which serologic testing and PCR methods for *tax* are being used to test samples from people with known and unknown HTLV-1 infection status to determine whether there is a difference between these two methods in detection of HTLV-1 infection.

Stephen Moses

Enhanced Surveillance for STD Risk and Health Care-Seeking Behaviours in Persons with STDs

This was a survey carried out in Winnipeg in a population-based sample of people with STDs. Information was collected on risk behaviour and health care seeking behaviour in order to identify predictors and correlates of these behaviours; as well, it was hoped to determine which surveillance activities could be added to regular case investigation.

Those eligible for the study were all people aged 15 to 60 who were resident in Winnipeg during 1997 and had been reported as having genital chlamydia, gonorrhea or syphilis. All nurse-managed cases and a random selection of physician-managed cases were included in the sample. Information was collected by means of a 25-item standardized questionnaire administered in person or by telephone.

Interviews were completed for 826 of 1,061 eligible people (78%); of these, 72% were female. The mean age was found to be 22 years and the median age 20 years; 40% were aged between 15 and 19 years. Chlamydia cases made up 84%, gonorrhea 12%, combined chlamydia and gonorrhea 3% and syphilis 0.1% of the total.

Table 1 shows the results with regard to age at first sexual intercourse. About 20% of the sample reported that first intercourse had been involuntary, and the mean age in this group at the time of intercourse (12.5 years) was significantly lower than that for the rest of the group (15.5 years).

Table 1
Results: Age at First Intercourse

	Mean	Median	Range
Overall	14.9	15	2-31
Voluntary	15.5*	15	11-31
Involuntary	12.5	13	2-19
• Males	10.2*	9	3-18
• Females	13.0	13	2-19

*p< 001

Multivariate analysis showed that the risk behaviours associated with involuntary first intercourse included injection drug use in the previous year (odds ratio [OR] 2.1 [1.1-4.2]), > 10 lifetime sexual partners (OR 1.2 [1.1-1.4]) and mean number of sexual partners in the previous year (8.4 as compared with 4.3 among those having voluntary first intercourse, p = 0.02).

Factors predictive of > 10 lifetime sexual partners were involuntary debut, male gender and use of alcohol or drugs before or during sex (Table 2). Table 3 shows the predictors of having had two or more partners in the previous year. Males and injection drug users were the groups most likely to report condom use for more than half their sexual encounters (Table 4).

With regard to health-seeking behaviour, females waited significantly longer to visit a physician after experiencing symptoms (Table 5); being female and being infected with chlamydia

Table 2
Results: Predictors of Ten or More Lifetime Sexual Partners

- 45% of sample had ≥ 10 lifetime partners
- Logistic regression results:

	OR Adj.	95% CI
Involuntary debut	2.1	1.4-3.2
Male Gender	2.4	1.7-3.5
Alcohol/Drugs	3.5	2.5-4.8

Entered in model: Age, gender, STD type, history of IDU, alcohol/drugs before/during sex, voluntary or involuntary first intercourse

Table 3
Results: Predictors of Two or More Sexual Partners in Last Year

- 66% of sample had ≥ 2 partners in last year
- Logistic regression results:

	OR Adj.	95% CI
Involuntary debut	1.6	1.1-2.5
Age <21	1.6	1.2-2.2
Male Gender	2.8	1.9-4.2
Alcohol/Drugs	2.7	1.9-4.0

Table 4
Results: Predictors of Condom Use "More Than Half the Time"

- Only 33% of sample used condoms "always" or "> half the time" with non-regular partners
- Logistic regression results:

	OR Adj.	95% CI
Male Gender	1.5	1.1-2.1
Injection drug use	2.5	1.1-5.8

Table 5
Results: Days Between Onset of Symptoms and Visit to Physician

	Mean	Median
Females	36.2**	10
Males	14.8	5
• Males < 21 yr	19.5*	7
• Males ≥ 21 yr	12.3	5

**p<.001
* p<.05

Table 6
Results: Predictors of Delay of More Than 1 Week Before Diagnosis

- 45% of sample waited > 1 week before seeing physician for diagnosis
- Logistic regression results:

	OR Adj.	95% CI
Female Gender	1.8	1.2-2.6
Chlamydia	2.0	1.2-3.5

were predictive of waiting longer than a week to obtain a diagnosis from the physician (Table 6).

Overall, a high prevalence of risk behaviours was found in this study, particularly the high numbers of sexual partners. Predictors of high-risk behaviour were male sex, younger age, involuntary first intercourse and drug or alcohol use with sexual activity. The lag between symptom onset and diagnosis was greatest among women, men under age 21 and those

with chlamydia infection. Collection of additional information to enhance surveillance data appears to be feasible and acceptable both to clients and health care providers.

Neil Heywood, Ron St. John

Immigration and Syphilis

Neil Heywood

One of the current requirements of immigrants and certain visitors to Canada is a medical examination, including (for those over age 15) a serologic test for syphilis. If the test has been confirmed as positive, the individual infected must undergo treatment before coming to Canada; he or she is then referred to the appropriate public health authority in Canada. However, several medical directors across Canada are questioning the need for this surveillance, given that the affected migrant has already been treated.

During 1995, medical officers in Health Canada and Citizenship and Immigration Canada were asked to review the routine immigration tests, with a specific focus on infectious diseases. A number of physicians, scientists and policy makers met at Chateau Montebello to discuss a framework for this review. The so-called Montebello Process was to develop a methodology that would allow analysis of certain infectious diseases insofar as they affect immigration.

Ron St. John

As a result of the Montebello Process, an approach towards immigration screening emerged, which was put forward to an expert consultative group that included individuals from the Centers for Disease Control and Prevention (CDC). The approach was approved, and a technical working group was formed. CDC members and, later, representatives from the U.K. and then Australia were part of the group. In June 1997 the technical working group produced an algorithm, whereby the infectious disease of interest would be rated according to several criteria — prevalence, seriousness (whether life-threatening), susceptibility to treatment, cost, transmissibility — to produce a final score, which could be compared with that of other diseases. Eight diseases, e.g. malaria, tuberculosis, syphilis, were chosen to test the algorithm. CDC participants suggested that an alternative model might be useful, and it was decided to compare the algorithm with a decision tree analysis.

In 1998, the results of the two analyses showed that the decision tree approach was much more robust and informative, and the algorithm was discarded. Decision tree analysis has the following features:

- it is a methodology for making decisions on the basis of what is known, what can be done and what is preferred

- it is explicit, quantitative and systematic
- it organizes issues for traditional problem-solving
- it identifies critical elements for intensive study
- it provides information (not answers) to decision makers

Figure 1 shows a decision analysis for the outcomes associated with a migrant of unknown syphilis status under the three conditions of screening for exclusion, screening for inclusion and no intervention. It is assumed that if the individual has syphilis then there will be spread to at least one other person. Figure 2 shows elaboration of one of the arms of the decision tree, screening to exclude, and follows the consequences of a false negative test result in a migrant who has syphilis. The probabilities of each possible event must be gathered from existing data and used in the model. The probabilities associated with syphilis are listed in Table 1, and the results obtained when they have been inserted into the model are given in Table 2. At a prevalence in the migrating population of 17.5 per 100,000 and a probability

Figure 1
Syphilis Decision Analysis

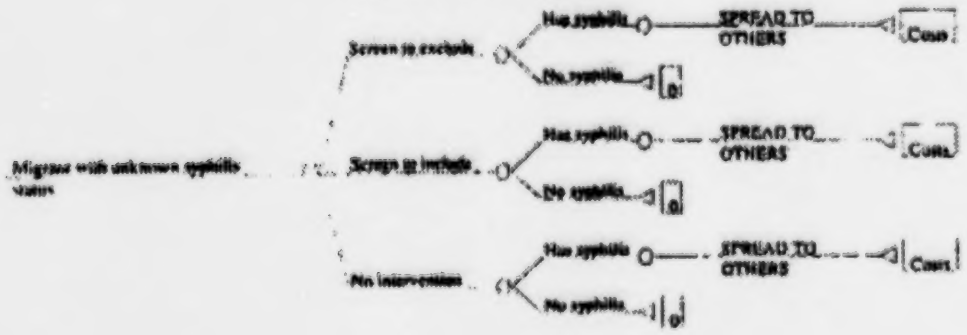


Figure 2
Syphilis Decision Analysis

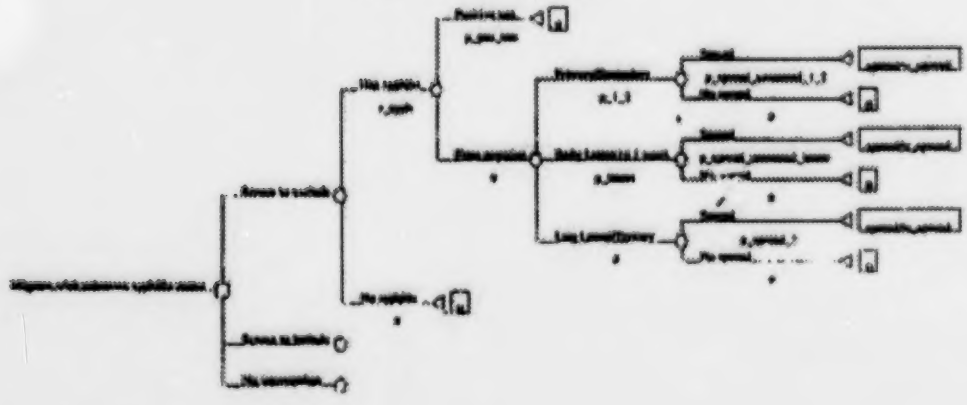


Table 1 Assumptions	
Variable	**Value assumed**
Prevalence of syphillis	0.000175 (17.5 per 100,000)
Probability of a positive test	0.98
Probability of 1° or 2° syphilis	0.15
Probability of early latent (< 1 year) syphilis	0.06
Probability of spreading if untreated 1°/2°	0.45
Probability of spreading if untreated early latent	0.1
Probability of spreading if untreated late latent/3°	0
Probability of spreading if treated 1°/2°	0.01
Probability of spreading if treated early latent	0.01
Probability of spreading if treated late latent/3°	0
Number of people spread to	1
Cost of spread (Test + treatment + contact tracing)	160

Table 2 Results Prevalence = 17.5/100,000			
Probability of Treatment Failure	**Screen to Exclude**	**Screen to include**	**No Screen**
0.01	0.0041	0.0099	0.2058
0	0.0041	0.0041	0.2058

of treatment failure of 0.01, the cost (in cents) is lowest in the "screen to exclude" decision arm. If treatment is completely reliable and there are no failures, the costs of screening to exclude and screening to include are the same. The conclusions are as follows:

- The optimal approach is to identify infected people.
- To prevent any spread, it is better to exclude infected people, but the availability of effective therapy reduces the probability of spread to near zero.
- Therefore, the optimal policy is to screen to identify infected people, to treat them appropriately and allow them to come into Canada.

The prevalence of syphilis would have to be extremely low (< 4 per million) before it was no longer necessary to screen. Because it is not possible to determine the costs of syphilis screening within the whole immigration system, questions of cost-effectiveness cannot be answered.

Panel Discussion

Dr. Patrick felt that the decision to continue screening was a wise one if we are looking towards elimination of endemic syphilis in Canada. He wondered what the results of the same approach are for HIV, given the evidence that people infected with HIV but successfully treated may be net contributors to the economy.

Dr. St. John responded that with respect to HIV the decision tree analysis (not including gains to society) shows that of the three decision arms the worst would be no intervention, i.e. the situation that is current in Canada. At present, migrants are not given the opportunity to know whether they are infected with HIV so that they can take steps to obtain treatment or protect their partners. However, analysis in the HIV situation is not complete.

Dr. Chernesky asked how the sensitivity and specificity of screening tests affect the results of the model. Dr. St. John stated that sensitivity was set at 0.98, and that changing it slightly made little difference to the outcomes. In response to a question about the value of screening for other infectious diseases, he mentioned that an analysis of hepatitis B is under way in this country, the United States and the U.K. are working on chlamydia, and leprosy is being investigated in Australia. The goal is to use the model for 12-15 diseases that have the most public health impact.

With regard to the issue of whether routine surveillance gives a true picture of STD in high-risk groups, Dr. Jolly stated that there is evidence of a growing prevalence of STDs within core, high-risk groups even though the rates overall may be dropping. She felt that the traditional public health approaches are not relevant here, and new approaches will be required. Dr. Haiek felt that the conference had been somewhat disappointing in its lack of consideration of behaviour and its consequences.

Dr. Patrick commented on the ranking of infectious diseases by the Advisory Committee on Epidemiology, and wondered why chlamydia, a highly prevalent STD, should have been placed below Jakob-Creutzfeldt disease. He also pointed out the lack of data on viral STDs, and suggested that a better job needs to be done of making the implications of these STDs more widely known. Dr. Chernesky was disappointed that there had been no mention over the past two days of bacterial vaginosis, vaginitis or trichomoniasis, all highly prevalent infections in women, which may amplify other infections and play a role in HIV acquisition.

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